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ABSTRACT

This guide provides materials for the first high school "Introduction to Industrial Technology Education" and "Exploration of Industrial Technology Education" Guides. It consists of three sections in addition to beginning remarks. Section I is the Instructor's Guide, which contains 12 major instructional units: overview; signs, symbols, and technical drawing; printing systems; photographic systems; telecommunication--hardwired systems; telecommunication--electromagnetic systems; storage and retrieval systems; telecommunication--audio/visual systems; careers; technological procedures; leadership; and future trends. Each unit consists of a unit title, set of competencies, content outline, teacher plans and activities, suggested student activities, and resources and references. Section II contains 17 Technology Activity Modules, a set of representative activities that may be used to address each major unit's goals. Each module contains instructor suggestions and student instructions. Section III, the resource section, contains a detailed list of resources, including curriculum guides, textbooks, and references; a sample set of useful periodicals, publisher, media sources, resource centers, and suppliers; and a directory for locating public domain software. Appendices include an illustration of the parts of a communication system, a comparison of printing processes, a discussion of photographic film, a diagram of a telephone circuit, interviewing tips with sample questions, a resume checklist, a paper titled "Telecommunications and Telecomputing" (Costello), and a concept outline of communication technology. (YLB)

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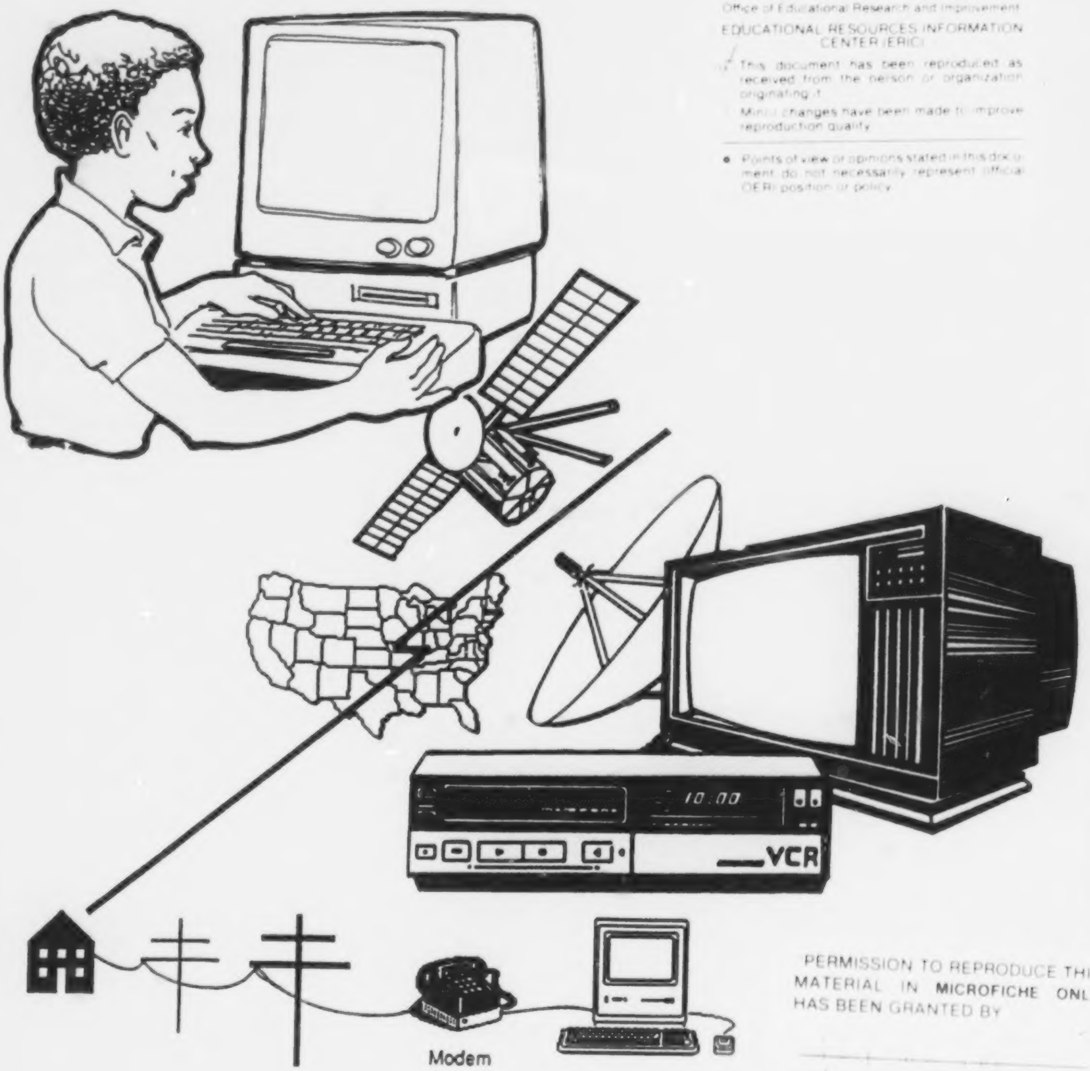
Missouri

Introduction to Communication Technology Guide



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Missouri

Introduction to Communication Technology Guide

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Introduction to Communication Technology is a guide which is specifically designed to support Missouri's industrial technology education teachers. It builds on, and is consistent with, the foundation established by the Missouri Industrial Education Guide and the junior/middle school guides for ITE: (Introduction to Industrial Technology Education, and Exploration of Industrial Technology Education). In addition, this document represents the first high-school-level communication curriculum guide since Missouri's redirection of its entire ITE program.

This guide could not have been developed and written without the assistance and talents of many individuals and groups. The members of the project's advisory board and the writers of the Technology Activity Modules, as named on the frontispiece, are an example of such dedication. This Guide is largely a product of their creative abilities.

The members of the project's fieldtest team also made significant contributions by suggesting corrections and revisions to the content, and thereby making it more realistic for implementation in Missouri's varied school environments.

Steve Coffman, Missouri's Industrial Technology Education Supervisor, deserves special acknowledgement and credit. His initiatives in conceiving and funding a long range plan to develop a series of industrial education guides is to be applauded. Special attention should also be focused on the preliminary work done by Dr. Charles Keseman. His conceptualization of the content outline of communication technology used in this guide laid the basis not only for the objectives but also for all of the succeeding curricular steps. In addition, some of the objectives, teacher plans, student activities and resources were taken from his creative work in developing the preceding Exploration of Industrial Technology guide. A stronger link between the two guides was established in this way.

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I would like to extend my appreciation to all of the individuals listed here and to many others unnamed because of space limitations.

Jerry J. Richter
Project Coordinator
June 1990

Foreword

This guide is dedicated to the advancement and improvement of Industrial Technology Education in the State of Missouri, and to all the dedicated and creative technology teachers that work with the country's most valuable resource--our youth. This guide is designed to support this noble effort by acting as:

- a primary resource for the Missouri Industrial Technology Education teacher for planning, implementing and teaching about communication technology.
- a model for the creation of Technology Activity Modules, and a beginning source of example communication TAMs that can, with appropriate preparation, be used directly in the classroom.
- a guide to assist educators and students in finding references or additional information about communication technology.

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Broad Goals: Communication Technology

The following broad goals for communication technology support the general goals listed in the 1987, Missouri Industrial Technology Education Guide. Since it is unreasonable to expect that anyone would fully master them, they should be thought of as general directions of inquiry. This Guide has been structured to help the user begin this inquiry.

Students should:

1. Identify the similarities and differences of selected technical communication systems.
2. Demonstrate the ability to effectively convey an idea using a selected technical communication system.
3. Identify and explain the function of each major component of a technical communication system.
4. Identify and compare the major graphic reproduction processes.
5. Identify and compare the major electronic communication systems.
6. Demonstrate an ability to use proper nomenclature associated with graphic and electronic communication systems.
7. Identify and assess personal interests, abilities and leadership potential as they relate to careers in communication technology.
8. Explain the need for using safe procedures when working with mechanical and electronic communication equipment.
9. Analyze the impact of a selected technical communication system on people and the natural environment.
10. Describe the role of computers as they are used in various technical communication systems in technology education.
11. Participate in the ITEA Student Association activities.
12. Employ the problem solving process to reach technical solutions.
13. Apply the skills acquired in math, reading, writing, and science to the content of technology and conversely.
14. Classify technical activities under the technological concepts they represent.

Assumptions Underlying the Curriculum

The following assumptions underlie the curriculum materials presented in this Introduction to Communication Technology Guide. They are listed below without regard to priority.

1. Fifty percent of class time should be devoted to lab activity.
2. The course should be supported by a multiple activity laboratory facility.
3. Concepts are remembered best when learned through hands-on activity.
4. The content should be based on a set of validated communication concepts.
5. The curricular materials should be flexible and adaptable to a wide variety of school settings.
6. Themes should be used where possible to help unify the curriculum.
7. The content of Communication Technology should reinforce the skills learned in math, reading, writing and science curriculum.
8. Students will have completed the Introduction to Technology curriculum before entering the Communication Technology curriculum.
9. The Guide will present a broad range of objectives and resources from which a teacher can design his/her own course.
10. The TAMs presented in the guide are examples; teachers are expected to create their own TAMs
11. The TAMs can be used with students at a variety of grade and ability levels.

How to Use This Guide

This guide consists of three sections in addition to the beginning remarks. Section I is the Instructor's Guide, Section II contains a sample set of Technology Activity Modules and Section III lists resources and other helpful materials.

Section I - The Instructor's Guide contains:

- Competencies for each of the twelve instructional units
- General instructional plans for each unit
- Content outlines for each unit
- Teacher and student activities for each unit
- Sample resources for each unit

Section II -The Technology Activity Modules contain:

- A set of representative activities that may be used to address each major unit's goals.
- Instructor suggestions for each TAM
- Student instructions for each TAM

Section III -The Resource Section contains:

- A detailed list of resources including curriculum guides, textbooks, and related references, useful to students and instructor.
- A sample set of useful periodicals, publishers, media sources, resource centers, and suppliers.
- A directory for locating public domain software, and a disk containing sample public domain software programs supportive of the major instructional units.

Time Frame for Instructional Delivery

The instructional units outlined in this guide may be used for "courses" of varying length. The duration of such courses could vary from a few days (for example, using one of the TAMs), to an entire year (using a set of TAMs and curricular ideas structured to meet identified goals). You are encouraged to guard against placing to large an emphasis on any one unit and attempt, instead, to teach a broad spectrum of concepts and skills.

Context for Introduction to Communication Technology within Industrial Technology Education.

The Introduction to Communication Technology Guide is intended to support the first high school course beyond the broad-based foundation provided by the Introduction to Industrial Technology and Exploration of Technology Guides. It is designed to build upon these previous experiences and to guide students to the mastery of higher level competencies. Articulation between the Introduction and Exploration guides and the Communication Guide is accomplished by repeating some of these **beginning competencies**, and building the **intermediate competencies** upon them.

Scope of the Content

This guide presents a "cafeteria" of curriculum content, far more than can be used in a single course. To work toward the broad goals of the Guide however, you are encouraged to employ a broad array of the content. Ultimately you will need to create your own "menu" of communication ideas and skills that best fit the curriculum of your local school setting.

How can this guide help me?

If you want to:

1. Plan major instuctional units for communication technology

White

Unit 1. Overview of Communication Technology
Unit 2. Signs. Symbols and Technical Drawing
Unit 3. Printing Systems for Communicatiom
Unit 4. Photographic Systems of Communication
Unit 5. Telecommunication-Hardwired Systems
Unit 6. Telecommunication-Electromagnetic Systems
Unit 7. Storage and Retrieval Systems
Unit 8. Telecommunication-Audio/Visual Systems
Unit 9. Careers in Communication Technology
Unit 10.Technological Procedures in Communication
Unit 11. Leadership in the Communication Fields
Unit 12. Future Trends in Communication Technology

2. Teach Technology Activities

Beige

TAM 1. Time Travel-Communication Style
TAM 2. Using ASCII for Telecommunication
TAM 3. CAD
TAM 4. Desktop Publishing
TAM 5. Pinhole Camers
TAM 6. Processing Transparency Film (Slides)
TAM 7. On-Line Computer Communication
TAM 8. Laser Applications
TAM 9. Fiber Optics
TAM 10. Intercom Systems
TAM 11. Home Security Monitoring Systems
TAM 12. FM Transmitters
TAM 13. Building an AM Receiver
TAM 14. Video Syncracies
TAM 15. Job Hunting Skills
TAM 16. Problem Solving Through Graphic Design
TAM 17. Animation

3. Identify Useful Resources

Blue

Books
Media
Periodicals
Resources Centers
Suppliers
Public Domain Software

Section I: Instructor Guides

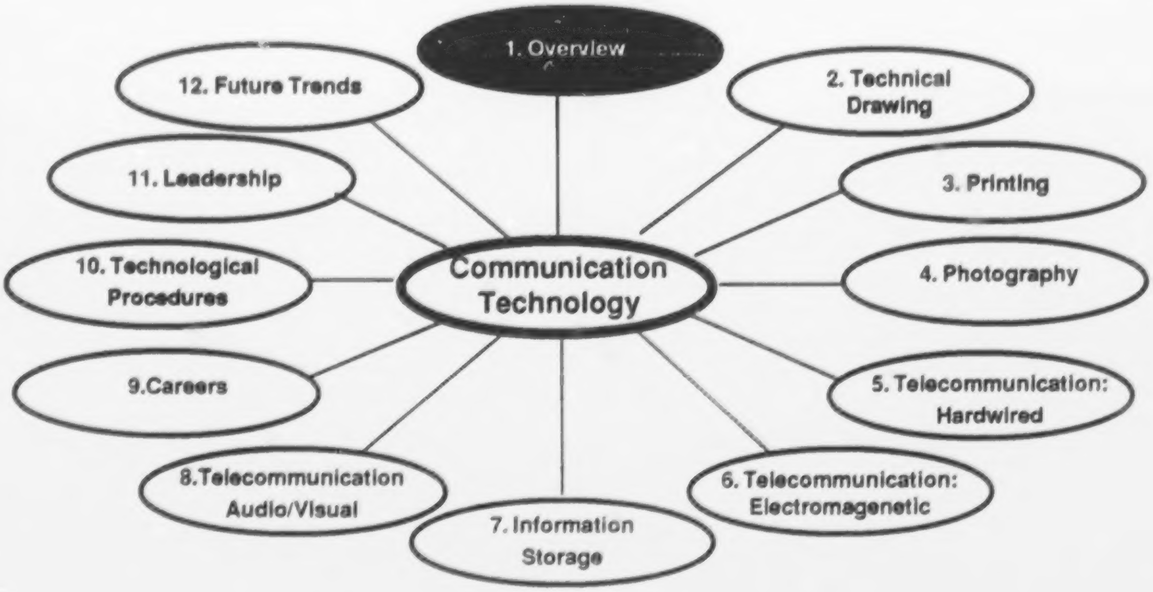
This section contains the twelve major instructional units listed below. Each unit consists of a unit title, set of competencies, content outline, teacher plans and activities (keyed to the competencies with their numbers ie. "C-4"), suggested student activities and resources and references. The units are broad. Often, too broad to be used in their entirety. Select and use those competences, plans and activities that are appropriate for your local school setting.

Unit 1.	Overview of Communication Technology
Unit 2.	Signs, Symbols and Technical Drawing
Unit 3.	Printing Systems for Communication
Unit 4.	Photographic Systems of Communication
Unit 5.	Telecommunication-Hardwired Systems
Unit 6.	Telecommunication-Electromagnetic Systems
Unit 7.	Storage and Retrieval Systems
Unit 8.	Telecommunication-Audio/Visual Systems
Unit 9.	Careers in Communication Technology
Unit 10.	Technological Procedures in Communication
Unit 11.	Leadership in the Communication Fields
Unit 12.	Future Trends in Communication Technology

The units also contain a generalized plan for teaching technology. It consists of five general steps: 1) Studying **tools and technical systems**, 2) Examining **how they work** and how they are used, 3) Exploring the **material results of their application**, 4) Investigating the **impacts these tools and devices have on individuals and groups**, and 5) Examining the **impacts they have on the natural environment**. Teaching at step 5 requires information learned at the preceding five steps. Try to reach step five when teaching about communication technology.

Missouri
Communication Technology Guide
Instructor Guide

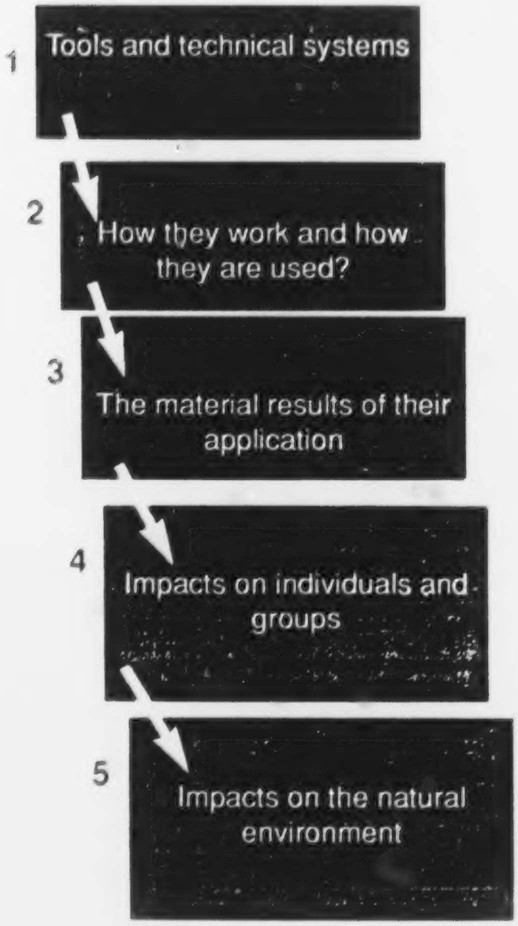
Unit 1
Overview of Communication


1. Overview
12. Future Trends
2. Technical Drawing
11. Leadership
3. Printing
10. Technological Procedures
Communication Technology
4. Photography
9.Careers
5. Telecommunication: Hardwired
8.Telecommunication Audio/Visual
7. Information Storage
6. Telecommunication: Electromagenetic

Unit Scope: Unit 1 is designed to be an overview of the body of knowledge called communciation. Definitions of communication and technology are explored along with a general model that describes any communication system. In addition the kinds of communication systems, their their historical development, purposes and impacts are reviewed. While these objectives are similar to those in the *Exploration of Industrial Technology Guide*, new student activities and additional resources are presented. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1	Tools and technical systems	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	How they work and how they are used?	Examine the scientific and technological concepts that explain how "things work."
3	The material results of their application	Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?
4	Impacts on individuals and groups	Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?
5	Impacts on the natural environment	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Content	Teachers' Plans and Activities
Overview of CommunicationTechnology	
A. Definitions 1. Communication 2. Optical/visual 3. Graphic 4. Acoustical 5. Audio 6. Broadcasting 7. Telecommunication 8. Technology	•Direct students to find and write 3 definitions of technology and 3 definitions of communication.Use encyclopedias, books, magazines or interviews, but not the dictionary. Ask students to write many of these definitions on the chalk board. Discuss the definitions and choose or formulate one for the class. C-2
	•Lead the class in a discussion of communication systems that no one wants to live without. Make a list of the suggestions, ie. newspapers, telephones radios, television. Show a video or film to stimulate ideas. C-1
C. Communication System Models	•Illustrate the idea that in concept all communication systems have identical and identifiable component parts. These include devices for encoding, transmitting, receiving, storing, retrieving and decoding. Frequently other concepts like interference and feedback are identified as well. C-3
	• Compare the similarities and differences of person-to-person, person-to-machine, and machine-to-machine communication. C-3
D. Relationship of Other Curricular Areas to Communication Technology 1. Scientific Principle 2. Mathematical Applications 3. Social/Cultural Applications 4. Language Arts Applications	• Communication can be thought of as an information processing system with inputs, processes and outputs. Use the "Communication System Model" in the Appendix (at the end of the Guide) and illustrate it to students. C-3

Unit 1: Overview of Communication Technology

Selected Competencies: The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals listed at the beginning of this Guide.

Beginning Competencies

1. Identify and discuss five technical communication systems that few people want to be without.
2. Using sources other than a dictionary, locate and write 3 definitions of the term" technology," and 3 definitions of the term "communication;" as a class formulate and adopt one definition of each.
3. Identify and draw a concept model of communication technology; name and list devices and procedures that are examples of each concept.
4. Analyze and compare three broad kinds of communication processes: person-to-person, person - to -machine, and machine-to-machine.
5. Follow the required safety regulations in all laboratory activities.

Intermediate Objectives

6. Create a timeline of communication technology based on significant developments in the history of communication technology.
7. Discuss the concept of communication technology as an information processing system.
8. Distinguish among the 5 purposes of communication.
9. Discuss the importance of regulatory agencies in the field of communication, and identify the similarities and differences of at least two of them.
10. Identify and illustrate the impacts of selected communication systems on people and the environment.
11. Identify and appraise the advantages and disadvantages of working at jobs in four or more selected communication fields.

Suggested Student Activities

•Locate and write 3 definitions of "technology" and 3 definitions of "communication". C-2

•Select and View a film that shows oldtime, current and futuristic communication systems. Contribute to a list of communication systems that everyone would agree they would not want to live without. C-1

•Take notes and be prepared to draw a concept model of communication technology. Write the names of two devices that represent examples of the concepts, for example:
Encoding: computer keyboard
Transmitting: Remote TV channel selector
Storing: Graphic lines on drafting paper. C-3

• Locate, clip and bring to class pictures that illustrate the three kinds of communication processes. C-3

Resources and References

•Encyclopedias, books, magazines, interviews with parents, teachers and other people.

• Barden and Hacker, Communication Technology, "What is Communication?" pp. 2-4. C-2

•Exploring Technology Education, Section B, Communication:
Program I-B"Introduction to Communication"
Program II-B"Designing Messages"
Program III-B"Producing and Transmitting Messages"
Program IV-B"Evaluating Messages"
Agency for Instructional
Technology, Box A, 1111 West
17th St., Bloomington, IN47402 C-1

•• Hendricks and Sterry, Communication Technology, pp. 318-327. C-3

•Richter, "Component Parts of Any Communication System" (See Appendix A). C-3

•Exploring Technology Education Instructional Materials, Section B, Communication.:
Program I-B "Introduction to Communication"

•Barden and Hacker, Communication Technology, pp.4-13 C-3

Content

E. Timeline of Communication
  1. Pre-Renaissance
    a. Egyptians
    b. Babylonians
    c. Phoenicians
    d. Chinese
    e. Greeks
    f. Romans
  2. Renaissance
    a. Integration of Printing Technology Components
      (1) Movable Type
      (2) Lockup System
      (3) Press
      (4) Paper
      (5) Ink
      (6) Usable Alphabet
    b. Attitude Toward Technological Development
  3. Industrial Revolution
    a. Control of Electricity
    b. Linotype
    c. Telegraph
    d. Telephone
    e. Phonograph
    f. Daguerrotype
    g. Wireless Telegraph
    h. Kinetoscope
    i. Box Camera/Roll Film
    j. Postal System
  4. Twentieth Century
    a. Radio
    b. Television
    c.. Computer
    d. Instant camera
    e.Radar/Sonar
    f. Disk/Tape Recorder
  5. Space Age
    a. Transistor
    b. Satellite
    c. Integrated Circuit
    d. Fiber Optics
    e. Personal Computer
E. Special Safety Concerns
  1. potential Hazards
  2. Equipment Safety Guards
  3. Personal Protective Equipment
  4. Past Records

Teachers' Plans and Activities

•Engender an attitude of safety when working with all laboratory equipment. C-5

Suggested Student Activities

•Using the teacher's directions do TAM #1: "Time Travel:Communication Style" C-6

•Through personal observation or by using appropriate media, identify potential hazards in communication technology. Describe potential hazards of forthcoming activities in the course, and the corrective methods applied to hazardous conditions. Throughout the course, note any safety concerns on a designated bulletin board and make note of all improvements in the lab. C-5

Resources and References

•Sorenson, TAM #1: "Time Travel: Communication Style" C-6

•Exploring Technology Education Videos, Section B Communication.:
Program I-B "Introduction to Communication"

Content

F. Careers in the Communication Industries
  1. Commercial Art and Design
    a. Designer
    b. Layout Artist
    c. Art Director
  2. Photography
    a. Press Photographer
    b. Freelance
    c. Commercial Photographer
    d. Portrait Photographer
  3. Engineering Drafting and Design
    a. Designer
    b. Drafter
    c. Checker
    d. CAD Technician
  4. Printing and Publishing
    a. Writer
    b. Editor
    c. Process Camera Photographer
    d. Press Operator
    e. Typesetter
    f. Bindery Worker
  5. Advertising
    a. Graphic Artist
    b. Writer
    c. Salesperson
  6. Broadcasting
    a. Writer
    b. Reporter
    c. Engineer
    d. Disc Jockey
    e. Audio Technician
    f. Lighting Technician
    g. Camera Technician
    h. Producer
    i. Director
  7. Cinematography
    a. Set Designer
    b.Camera Technician
    c. Audio Technician
    d. Lighting Technician
    e. Writer
    f. Director
    g. Film Editor
  8. Telecommunication
    a. Telephone Operator
    b. Installation and Repair Specialist
    c.Line Construction and Maintenance Workers
    d. Central Office Installers

Teachers' Plans and Activities

•Identify 6 jobs in the communication field that young people can do with :
  a. no high school education
  b. a high school education only
  c. Trade or technical school training
  d. College education
Describe each job and estimate the starting pay.
C-11

I. Regulation of Communication
  1. Federal Communication Commission
  2. Federal Trade Commission
  3. American National Standards Institute
  4. National Association of Broadcasting

•Select two communication regulatory agencies, such as the Federal Communication Commission and the American National Standards Institute; describe how they are similar and how they are different. C-9

Suggested Student Activities	Resources and References
•Identify 3 jobs in the communication field that hold an interest for you. C-11	•Occupational Outlook Handbook. 1989. C-11 •Exploring Technology Education Videos, Section B Communication.: Program I-B "Introduction to Communication"
•Create a chart that lists the similarities and differences of the FCC and ANSI. C-9	•Consult any encyclopedia for a description of regulatory agencies generally, and the FCC and ANSI specifically. C-9

Content	Teachers' Plans and Activities
J. Impacts of Communication Technology 1. Health 2. Learning 3. Environment 4. Family 5. Social/Cultural 6. Economic	• Identify and investigate the effects that selected communication technologies have on human behavior or the environment. Examples might include investigating the relationship of: 1. Television and the health of children 2. Computers and student learning rates 3. Disposal of photographic chemicals and the environment 4. Newspaper publishing and the disposal of newsprint 5. Teenagers and telephone usage 6. Others C-10

Suggested Student Activities

- Write a report that describes the relationship of a communication device and how it dictates or changes human behavior. C-10

Resources and References

- Reader's Guide or other library reference system, locate and review magazines with appropriate articles

Missouri
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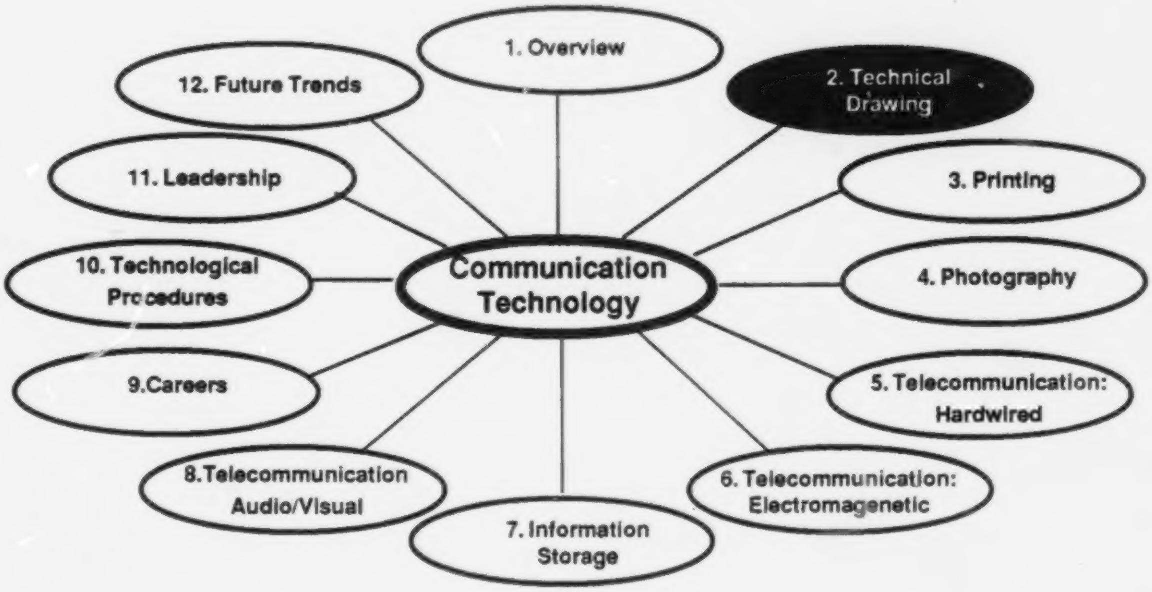
Unit 2
Signs, Symbols and Technical Drawing


1. Overview
2. Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication: Electromagenetic
7. Information Storage
8.Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: The beginning competencies in this unit are designed to aquaint students with the introductory concepts and skills in the area of technical drawing. These are an extension of the objectives that appear in the *Missouri Introduction to Industrial Technology Guide*. The intermediate objectives are more sophisticated. They offer a greater challenge in teaching communication, especially in the area of computer aided drafting. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.

1	**Tools and technical systems**	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	**How they work and how they are used?**	Examine the scientific and technological concepts that explain how "things work."
3	**The material results of their application**	Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?
4	**Impacts on individuals and groups**	Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?
5	**Impacts on the natural environment**	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit -2: Signs, Symbols and Technical Drawing

Selected Competencies: The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals listed at the beginning of this Guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of: graphic, pictograph, alphabets, numeral, substrate, technical drawing, ANSI, pictorial, orthographic, schematic, perspective, isometric.
2. Regularly use terms related to technology along with the proper names of equipment, materials and processes in classroom, laboratory, and informal conversations.
3. State one difference between numerals in decimal and numerals in binary form and identify at least one application of each.
4. List writing instruments and related substrates used in early civilizations and describe how the available influenced the forms of the symbols used by that civilization.
5. Draw the necessary orthographic and pictorial views of selected objects to reduced scale.
6. Draw with a T-square, triangles, and a scale, with a drafting machine and /or with a computer, the necessary orthographic and pictorial views of selected objects.
7. Draw standard line symbols using a technical pen and India ink.
8. Draw a specified shape using a template.
9. Describe the size of an object by properly placing dimensions on the drawing.

Intermediate Competencies:

10. List and define in writing basic computer aided drafting terminology.
11. Locate and use the functions of the main components of a CAD system; demonstrate the ability to create, edit, modify, save and plot a drawing.
12. Identify and explain the advantages and disadvantages of using CAD to communicate design ideas.
13. Identify and discuss specialized non-keyboard computer devices for imputing data into CAD systems.
14. Distinguish among the various hardcopy and softcopy output hardware for CAD systems.
15. Discuss and list the problems that your community would encounter if people were unable to store and retrieve technical drawings for later use.
16. Demonstrate a working kn owledge of the common units of measure in the SI Metric System.
17. Memorize and recall for later use the common symbols used for residential house drawings.
18. Verbally explain the similarities and differences of any two specialized drafting fields such as architectural and structural drafting.
19. Review the job listings in the classified ads of a small town newspaper and those in a large urban area newspaper; clip or copy the listings and discuss the job opportunities in class.
20. Using technical drawing as the media , identify and list three or more examples that reflect the following communication concepts: encoding, storing, retrieving, transmitting, receiving, decoding and interference. Use the concept outline of Communication Technology in the appendix.

Content

Signs, Symbols and Technical Drawing

A. Pictographs

B. Alphanumeric Symbols/Messages
  1. Alphabets
  2. Numerals
    a. Decimal
    b. Hexadecimal
    c. Binary
    d. Duodecimal
  3. Equipment and Materials
    a. Quill/Brush and Papyrus
    b. Chisel and Stone
    c. Stylus and Clay
    d. Pencil/Ink and Paper
    e. Movable type
    f. Typewriter
    g. Abacus
    h. Slide rule
    I. Computer
  4. Impacts
    a. Extended Communication
    b. Stimulate Trade
    c. Allow Record Keeping
    d. Provide Personal
    e. Encourage Cultural Exchange
    f. Broad Based Standardization

Teachers' Plans and Activities

•Direct student to find, copy and bring to class several common symbols that are used frequently in their environment, especially international symbols. Compare these to symbols that were used by an old civilization, such as the Romans or the Aztec Indians. C-4

•Illustrate and compare decimal and binary number systems.

•Review TAM:"Using ASCII for Telecommunication": discuss the usefulness of ASCII code.C-4

•Review and use the Selected Competencies and Suggested Student Activities in the Missouri Introduction to Industrial Technology Guide, 1988 pp. 37-44.

•Select and use activities from the Missouri Exploration of Technology Guide, 1988. The following six activities are suggested examples (see next column).

Suggested Student Activities	Resources and References
•Select and sketch several examples of common symbols such as those used on maps, by hospitals, in sports and travel. Each student should present at least three to the class, and ask them to guess their meanings.	•Jones, Discovering Technology Communication, Activity Guide, pp. 27-30; Hacker, Living With Technology, pp. 136-137. C-4
•Participate in a class discussion comparing binary and decimal number systems and their applications. c-3	
Using the teacher's directions, do TAM:"Using ASCII for Telecommunications". C-4	•Kahoe, "Using ASCII for Telecommunication"; Two Macintosh computers or comparable equipment.
	•Jones, Discovering Technology Communication, p. 60; Kirkpatrick, Basic Industrial Drafting Skills, pp 40-41; French, Graphic Science and Design
•Participate in a class demonstration related to scaling drawings in inches and metric measure. C-5	Jones, Discovering Technology Communication, p. 60; Kirkpatrick, Basic Industrial Drafting Skills pp. 40-41; French, Graphic Science and Design, p. 53. C-5
•Complete a worksheet related to measuring and drawing lines and circles to specified scales in inches and metric units.	
•Complete full size and instrument drawings of orthographic views needed to describe specified objects using t-square and triangles and/or drafting machine. C-5	•Listar, Technology Activity Guide-1, pp. 29-31; Kirkpatrick, Basic Industrial Drafting Skills, pp. 181-183; other suitable drafting text, drafting equipment and machines. C-5

Content

C. Technical Drawing Symbols/Messages
  1. Drawing Sub-Systems
    a. Pictorial
    b. Orthographic
    c. Schematic
  2. Production Sequence
    a. Plan Layout and Content
    b. Make Original Drawing
    c. Check Accuracy
    d. Make Copies
    e. Fasten or Mount Copies
    f. Store Original
  3. Basic Purposes
    a. Show shape
    b. Show size
    c. Show Relationships
    d. Show Characteristics
  4. Equipment and Materials
    a. Pencils
    b. Pen and Ink
    c. Graph Paper
    d. Drafting vellum
    e. Drafting film
    f. T-square and triangles
    g. Scales
    h. Templates
    i. Drafting machine
    j. Diazo machine
    k. Computer/Tablet/Plotter
    l. Other
  5. Basic Principles
    a. Sketching
    b. Instrument drawing
    c. Computer Aided Drawing (CAD)
    d. Linear Measurement
    e. Line Weights and Codes
    f. Orthographic Projector
    g. Pictorial
    h. Lettering
    i. Dimensioning
    j. Rendering
    k. ANSI Standards
  6. Applications (other)
    a. Graph data
    b. Mapping
    c. Schematic drawing
    d. Chart a music score
    e. Diagram athletic plays
    f. Diagram computer flow charts

Teachers' Plans and Activities

•Lead a brainstorming session and lead the class in identifying the advantages of computer-aided drafting over manual drawing systems; identify disadvantages. C-12

•Find and assign for students to read literature about typical CAD systems that discuss: hardware, the CPU, display terminals, input devices, input devices, plotters, storage, memory devices, and software. C-12

•Using sketches, textbook pictures and other graphics, show and describe various non-terminal input hardware. C-13

•Review and Assign TAM: "Computer Aided Drafting." C-11

Suggested Student Activities	Resources and References
•Complete a drawing using technical pens and India ink. C-7 •Participate in a class demonstration related to proper use of various templates. C-8 •Complete one and two-point perspective drawings of specified objects. C-5 •Dimension the orthographic view of a drawing to provide size description.	• Technical pens and India ink. C-7 •Use a variety of templates. C-8
•Participate in brainstorming the advantages and disadvantages of CAD. C-12 •Read literature about the component parts of typical CAD systems. C-12 •Discuss the advantages and disadvantages of digitizers, function menics, mice and other input devices. C-13	•Duelm, Applications Workbook for Computer Aided Drawing. pp. 13-45. C-12 •Duelm, Computer-Aided Drafting,pp. 129-207. Duelm, Application Workbook for Computer Aided Drawing. pp. 49-93. C-12 •Exploring Technology Education Instructional Materials, Section B, Communication.: Program III-B "Producing and Transmitting Messages" • Exploring Technology Education Videos, Section B Communication.: Program II-B "Designing Messages"
•Using the teacher' s directions, do TAM #3: CAD. C-11 •Using the CAD equipment available to you, practice using drawing aids, draw points, lines, polygons, arcs, circles and curves. Practice editing your drawings. C-11	•Palmer, TAM #3: "CAD." C-11 •Norton, MS-DOS and PC-DOS, User's Guide, p. 100; or other suitable book. •Stallings, Computer's: The User's Perspective, pp.114-115. C-11

Content	Teachers' Plans and Activities
7. Impacts a. Communication in Manufacturing and Construction b. Standardization of Parts c. Consumer goods, maintenance and repair d. Influence the Economy e. Provide historical records f. Provide artistic expression	
D. Careers	•Lead a class discussion on jobs available in the area of drafting; classify and discuss job opportunities in drafting areas such as mechanical, architectual, electrical, etc.

Suggested Student Activities	Resources and References
	•Exploring Technology Education Videos, Section B, Communication.: Program I-B "Introduction to Communication"
•Each student should clip or copy two or more job listings for drafters. Bring these to class and report the findings. C-16	•Local and regional newspapers, job opportunities. C-16

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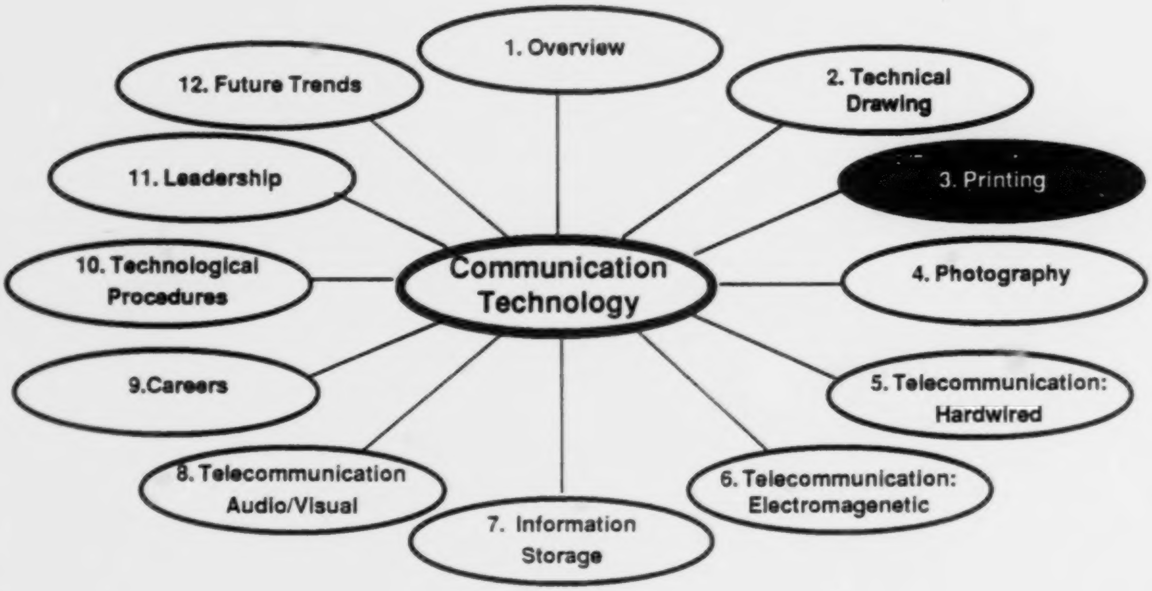
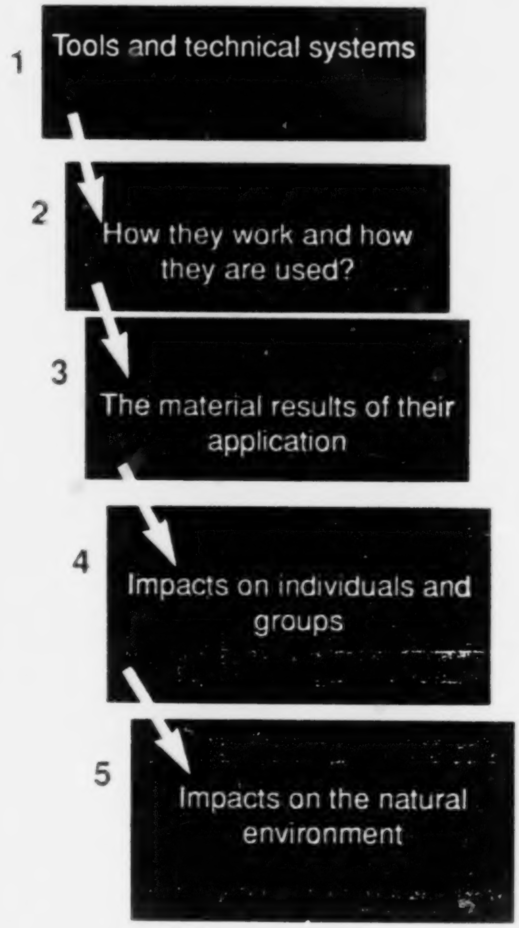
Unit 3
Printing Systems for Communication


1. Overview
2. Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: The beginning competencies are presented as a review of the introductory concepts necessary to understand printing as an area of communication technology. The intermediate objectives are more advanced . They offer a greater challenge in the areas of printing subsystems, advanced concepts and processes, human relationship skills, problem solving, career analysis and the impacts of printing technology. Select and use the competencies appropriate for your local curriculum plan.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1	Tools and technical systems	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	How they work and how they are used?	Examine the scientific and technological concepts that explain how "things work."
3	The material results of their application	Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?
4	Impacts on individuals and groups	Describe what happens when new tools and technical systems are introduced into our homes and work place How must people change? What new skills must be learned?
5	Impacts on the natural environment	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 3: Printing Systems for Communication

Selected Competencies. The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals listed at the beginning of this Guide.

Beginning Competencies.

1. Define by completing statements with appropriate words or write definitions of : Orthochromatic, lithography, offset, letterpress, gravure, screen process clip art, halftone, proofread, pasteup, score, collate, foundry type, cropping, stripping, flat, web fed.

2. Regularly use terms related to technology along with the proper names of equipment, materials and processes in classroom, laboratory and informal conversations.

3. List at least five items of equipment used to print a message.

4. List at least five substrates on which messages are printed.
6. List or sketch in the proper sequence the production steps for reproducing printed images and computer images.
7. Apply the principles of message analysis for selected printed messages.

8. Apply the production steps safely to reproduce a printed image.

13. Apply the production steps to reproduce an image using a computer printer or plotter.

- Note: The above compentencies are a few selected from the Missouri Exploration of Industrial Technology Guide.

Intermediate Competencies.

14. In table form, compare the processes of letterpress, offset, screen and gravure printing as characterized by the nature of their printing surface, simple plate sketch, simple press sketch and their resulting printed images.

15. Select any two major printing processes and describe their similarities and differences.

16. Name and draw an example of the six categories of type face designs.

17. Explain and show the differences among setting type by hand, photographically, and electronically.

18. Compare and list the differences between mechanical and electronic pasteup procedures.

19. Identify, name, and describe the component parts of a desktop publishing system.

20. Describe the similarities and differences in making plates for letterpress, offset, screen and gravure printing.

21. Demonstrate an ability to do simple copyfitting calculations.

22. Using a criteria provided (see appendix) and a magnifying glass, identify, clip and mount a commercially printed example of letterpress, offset, screen and gravure printing.

23. Research and discuss the U. S. Food and Drug Administration's policy on acceptable practice for printed food packages and labels.

24. Review the job listings in the classified ads of a small town newspaper and those in a large urban area newspaper; clip or copy the listings and discuss the job opportunities in class.

25. Analyze the impact that discarded printed products have on the natural environment.

26. Select several of the technical activities completed in this unit and compare them to the concept outline of communication technology in the appendix. Find the concept that best explains the activity.

Content

Printed Graphic Reproduction

- A. Image Transfer Subsystems
  1. Relief Printing
  2. Planographic Printing
  3. Gravure Printing
  4. Stencil Printing
  5. Ink jet Printing
  6. Electrostatic Copying
  7. Diazo Copying
  8. Spirit Duplicating
  9. Stencil Duplicating
  10. Facsimile Transmission

- B. Production Sequence
  1. Perform Message Analysis
  2. Create Design
  3. Generate Image
  4. Assemble Image
  5. Convert Image
  6. Prepare Image Carrier
  7. Transfer Image
  8. Finish/Bind Product

- C. Equipment and Materials
  1. Process Cameras
  2. Presses/Duplicators
  3. Light Tables
  4. Word Processors
  5. Folders
  6. Paper Cutters
  7. Fasteners
  8. Paper/ Substrates
  9. Film
  10. Ink
  11. Chemicals
  12. Other

Teachers' Plans and Activities

• Discuss and show illustrations that compare letterpress, offset, screen and gravure printing in terms of: the nature of their printing surface (raised, sunken, flat or perforated), plate characteristics (thickness, weight, material) simple functional sketch of press (flatbed, rotary), and characteristics of resulting printed images (straight , stair-step, looping , squeeze out). Provide students with a blank chart on which they can take notes and make sketches. C-14

•With student's plan, organize and print a selected product. C-18

•Demonstrate mechanical paste up procedures; do the same procedure using electronic pasteup techniques on a personal computer. C-18

••Demonstrate the similarities and differences in making plates for offset, letterpress, screen and gravure printing. Attempt to compare at least two. Assign a platemaking project to small student groups. C-20

•Ask students to find and clip or copy examples of graphic images made by the letterpress, offset, screen, and gravure process; mount, label and bring to class. C-22

Suggested Student Activities

- •Fill in a blank chart provided by the teacher with notes and drawings. C-14
- •Read the assigned textbook material related to each concept introduced.
- •Design a printed product to meet the purpose and audience identified. Prepare at least six thumbnail sketches; draw a rough sketch of the best one or two choices, and after discussing your work with the instructor, prepare a comprehensive drawing applying the principles of design. C-7
- •Complete a mechanical pasteup; create an identical pasteup electronically. C-18
- •Plan a production sequence for a selected printed/ copied product. The complexity of the product will be determined by the time and equipment available. If both time and equipment are limited the product may be assembled as a master and reproduced on a copier. But if a process camera and a press or duplicator are available, a more complex product may be completed using an offset press or screen process printing. Ideas for a selected printed product might include: safety poster, flyers for a school activity or to promote industrial classes, T-shirts with class motto or theme for communication, bumper stickers, novelty items for a special event, newsletter, game making, scoring pad, a calendar, personalized stationery, etc. C-18
- •Use a 5x magnifying glass, find and cut or copy commercial printed examples of letterpress, offset, gravure and screen printing; mount these, label the specimens by process used to print them. See appendix chart " Major Printing Processes Compared." C-22
- •Observe the platemaking demonstration; as part of a small group, create a plate. C-20

Resources and References

•Missouri Introduction to Industrial Technology Guide,1988, p 51-61.

•See Appendix B, Chart of "Major Printing Processes Compared".

•Prust, Graphic Communications, pp. 391-446. C-14

•Exploring Technology Education Instructional Materials, Section B. Communication.: Program II-B "Designing Messages"

•Spence, Graphic Reproduction, pp 73-75. C-7

•Locate and use PC's available to you. Use software programs such as print shop or Mac Draw, that are compatible with local computers. Use selected graphic arts test books available in your library or school. C-18

•Available equipment in your school or community
•Hacker, Living with Technology, pp 162-163, 208 -209;
•Heiner, People Create Technology Activity Manual, pp. 71-76;
•Harms, Communication Technology Activities, pp. 21-25;
•Texas, Communication Systems Guide, pp 93-104;
•Goetsch, Technology and You, p 288;
•Jones, Discovering Communication Technology, Activity Guide, pp. 40 - 58;
•Illinois, Communication Technology Curriculum Guide, pp 49-50;
•Fales, Technology, Today and Tomorrow, pp 106-113. C-18
•Spence, Graphic Reproduction, pp.69-73,
•Prust, Graphic Reproduction, pp.27-40. C-18
•Dorovos, Comprehensive Graphic Arts Instructor's Guide, Sections 8-15. C-20

•See Appendix B: Chart of "Major Printing Processes Compared." C-22

Content

D. Basic Principles
  1. Message Analysis
  2. Design principles
  3. Image Generation
  4. Image Assembly
  5. Camera Operation
  6. Exposure Control
  7. Film Composition
  8. Chemical Processing
  9. Halftone/ Color Separation
  10. Image Carrier Preparation
  11. Press/Duplicator/ Copier Operations
  12. Finishing /Binding Operation
  13. Paper and Ink Productions
  14. Cost Estimation

E. Computer Generated Graphic Reproduction
  1. Graphic Output Subsystems
    a. Computer Printing/ Desktop Publishing
    b. Computer Plotting
    c. computer Generated Slides
    d. Microform Storage of Computer Data
  2. Production Sequence
    a. Perform Message Analysis
    b. Create Design
    c. Generate Image
    d. Assemble Image
    e. Transfer Image
    f. Finish / Bind Product
  3. Equipment and Materials
    a. Word Processors
    b. Scanners
    c. Printers/Plotters
    d. Reader /Printers
    e. Software
    f. Paper
    g. Microform Substrates
    h. Instant Slide Film

F. Applications
  1. Recording of History
  2. Education
  3. Advertising
  4. Decoration
  5. Entertainment
  6. Identification
  7. Other

Teachers' Plans and Activities

•Sketch illustrations of the six categories of type styles: Roman, San Serif, Square Serif, Text, Scrip, and Decorative. C-16

•Select and assign copyfitting problems; explain the need for copyfitting in the message design process, and demonstrate how to perform the calculations. C-21

•Use appropriate visual aids to depict the similarities and differences of two major printing processes, for example, Offset vs. Screenprinting. C-15

•Using your local resources demonstrate various methods of setting type. Contrast an old method with a modem way of setting type. C-17

•Demonstrate mechanical paste up procedures; do the same procedure using electronic pasteup techniques on a personal computer. C-18

Review and assign TAM # 4 , "Desktop Publishing"

Suggested Student Activities	Resources and References
•Using the teacher's chalkboard sketch as a guide, draw the initials of your first and last name in each of the major type styles. C-16	•Exploring Technology Education Videos, Section B, Communication.: Program II-B "Designing Messages"
Successfully complete the assigned copyfitting problems. C-21	•Spence, Graphic Reproduction, "Copyfitting, " pp. 52-54. C-21
	Any film depicting the impact of solid waste disposed on the environment. C-25
•View the presentation, make notes on the key similarities and differences between two selected printing processes. C-15	
•Observe the demonstration. C-17	•Locate and use PC's available to you. Use software programs such as print shop or Mac Draw, that are compatible with local computers. Use selected graphic arts test books available in your library or school. C-18
•Complete a mechanical pasteup; create an identical pasteup electronically. C-18	•Bennet, Desktop Publishing: Producing Professional Publications, 1989. "
•Complete TAM # 4, "Desktop Publishing " C-19	•Rankin, Mark. TAM # 4 , "Desktop Publishing".

Content

G. Impact
  1. Free press and democracy
  2. Expand time and location awareness
  3. Provide personal and Historical Records
  4. Provide Personal Enjoyment
  5. Influence the Economy
  6. Influence Consumer Choice
  7. Potential for being Abusive and Misleading
  8. Provide for Artistic Expression
  9. Potential for Large Quantities of Waste Material
  10. Other

H. Careers

Teachers' Plans and Activities

•Review the U. S. Food and Drug Administration's policy on acceptable practice for printed food packages and labels. C-23

•Assign the task of cutting or copying job listings form a small town and large city newspaper; discuss in class. C-24

•Lead the class in an analysis of the impact of disposed printed products on the natural environment. C-25

•Explain the concept outline of communication technology. C-26

Suggested Student Activities	Resources and References
•Divide the class into halves. Debate whether the FDA's policy is too liberal allowing misrepresentation in advertising, or too conservative, restricting 1st amendment rights. half the class should find, copy and bring to class articles that claim misrepresentation in advertising; the other half should find articles on the importance of the 1st amendment right of free speech. teacher should set up rules and monitor the debate by listing major points that each teacher makes, on the chalkboard. Select another teacher or students to judge the debate on the strength of the arguments presented. C-23	•Any film depicting the impact of solid waste disposed on the environment. C-25 •Hendricks and Sterry, Communication Technology , " An Introduction to Communication Technology Concepts,"pp 95-114; " "Understanding concepts of Communication technology", pp 115- 186; " A taxonomy of Communication Technology " pp 317-327. C-26
•Cut or copy job listings from a small and large town newspaper and bring to class for discussion. Write and list the ways that they are different from each other. C-24	•Select and use a small town newspaper and a newspaper from a large urban area. C-24
•Identify and list the ways that discarded products have a negative impact on the environment, for example: landfills, dumping in seas, air pollution from incinerators, unsightly litter, etc. C-25	•Any film depicting the impact of solid waste disposed on the environment. C-25
•Select several of the technical activities completed in this unit and compare them to the concept outline of communication technology in the Appendix. Find the concept that best explains the activity. C-26	•Hendricks and Sterry, Communication Technology, "A Taxonomy of Communication Technology". pp.317-327.

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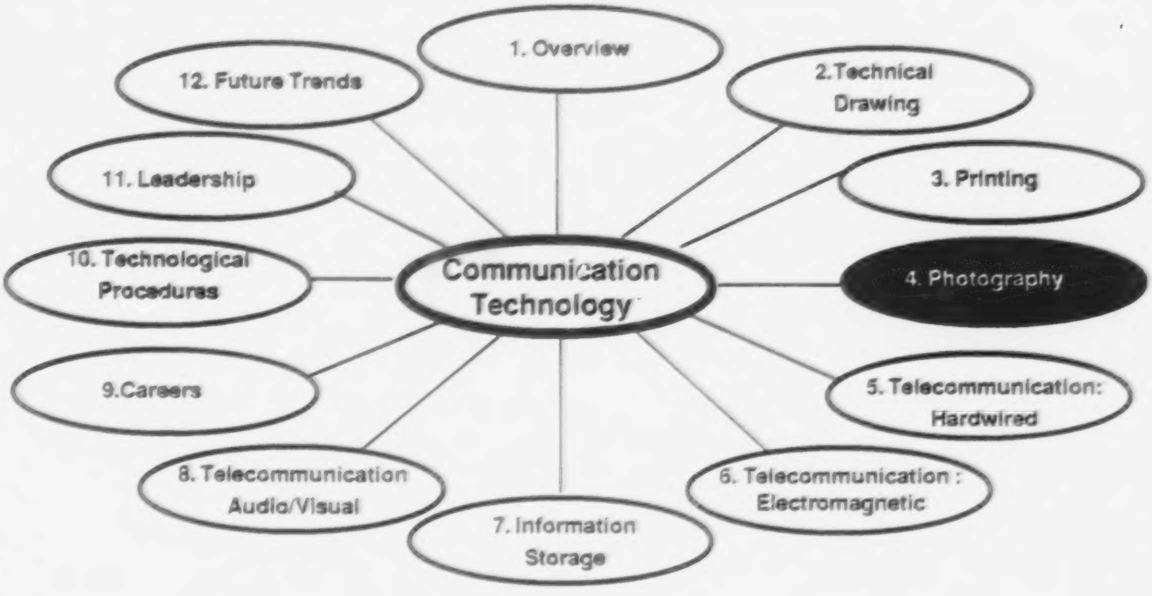
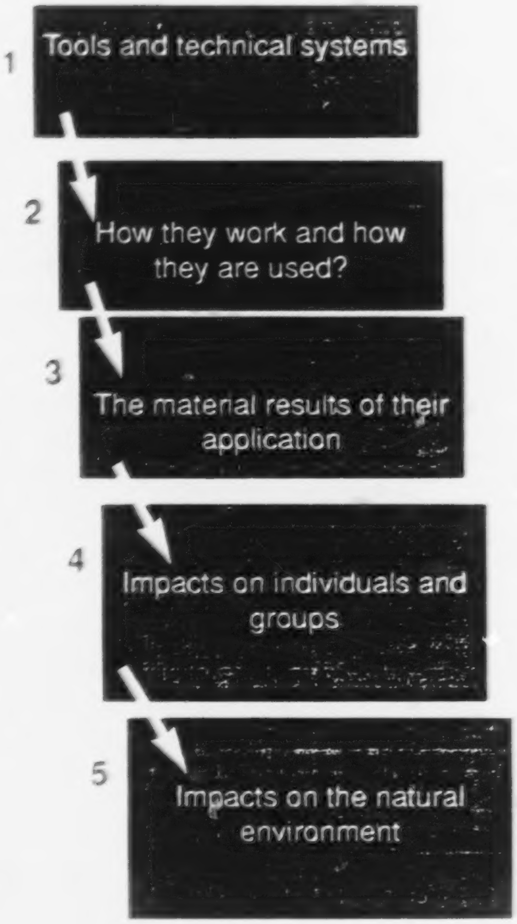
Unit 4
Photographic Systems of Communication


1. Overview
2.Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication : Electromagnetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: The beginning competencies are presented as a review of the introductory concepts necessary to understand photography as an area of communication technology. The intermediate competencies are more advanced. They offer a greater challenge in the area of photographic subsystems, advanced concepts and processes, human relationship skills, problem solving, and career analysis and the social impacts of photography. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.


1
Tools and technical systems
2
How they work and how they are used?
3
The material results of their application
4
Impacts on individuals and groups
5
Impacts on the natural environment

Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.

Examine the scientific and technological concepts that explain how "things work."

Explore what happens when new communicaton tools are marketed and widely accepted. How do things stay the same, and how do they change?

Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?

Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 4: Photographic Systems of Communication

Selected Competencies. The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals at the beginning of this Guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of: exposure, depth of field, aperture, F-stop, shutter, pixel, developer, stop bath, fixer, panchromatic, emulsion, antihalation layer, latent image, continuous tone.
2. Regularly use terms related to technology along with the proper names of equipment, materials and processes in classroom, laboratory and informal conversations.
3. Outline the proper order of the production sequence used in photography.
4. Identify the four variables related to exposure control and tell how each may be adjusted to provide proper exposure of a photo.
5. Apply principles of photographic composition when exposing a roll of film.
6. State the process sequence used in processing photographic film and in processing photographic prints and describe the differences between the two sequences including the chemicals used and the time required for each step.
7. Develop a roll of film following proper safety procedures for handling chemicals.
8. Expose and develop a contact print and a projection print using proper safety procedures.
9. Mount a photographic print for display.

Intermediate Competencies:

10. In a group and using the criteria provided (see appendix), analyze the technical and compositional qualities of photographs created by classmates.
11. Discuss the concept of "failure as normal" in the production of photographic images.
12. Demonstrate that you can maintain a time schedule by completing an assigned set of photographic production steps within a specified time period.
13. Explain, in writing, how flash exposure works, include the following terms in your essay: aperture, guide number, manual flash exposure, bounce flash, fill flash, flash meter and synchronization.
14. Distinguish the differences between electronic flash, automatic flash and dedicated flash.
15. Using the troubleshooting criteria provided (see appendix), analyze prints made with negatives exposed with flash; identify the problem and suggest solutions.
16. Expose and process color transparency film.
17. Identify, sketch and describe the function of each layer in color transparency film.
18. Using a 35mm camera built within the last two years, identify and describe how the following subsystems work: focusing, film advance, lens changing, hot shoe, ISO setting, shutter speed, and aperture adjustment.
19. Compare and contrast the work of three well known photographers; compare their work to that done by photographers who advertise in the yellow pages of your community.
20. Review the job listings in the classified ads of a small town newspaper and those in a large urban area newspaper; clip or copy the listings and discuss the job opportunities in class.
21. Investigate the democratization of photography: Identify and debate which key inventions placed photography in the hands of everyone.
22. Compare the democratization of photography to similar occurrences in the fields of television and computer technology.
23. Discuss the theory that underlies "Motion Pictures" including: "persistence of vision", equipment needed for home movies, and the main components of a projector and camera.

Content

II. Photographic systems of Communication
  A. Photographic Sub-Systems
    1. Black and White Negatives
    2. Color Negative
    3. Color Transparency
    4. Motion
    5. Instant
    6. Photo-Video Imaging
    7. Holography
    8. Radiography/ X-Ray
    9. Thermography/ Infrared
  B. Production Sequence
    1. Image Composition
    2. Image Exposure
    3. Image Conversion
    4. Image Reproduction
    5. Image Presentation

Teachers' Plans and Activities

•Review the Selected Competencies and Suggested Student Activities of the Missouri Introduction to Industrial Technology Guide, 1988, pp 45-50.

•Select and use activities from Missouri Exploration of Industrial Technology Guide, 1988.

•Review "Exposure Controls " handout (see Appendix F). C-4

•Using commercial prints found in magazines, illustrate 5 principles of photographic composition including: Center of interest, framing, leading lines, mergers and rule of thirds C-5

•Lead a discussion on how to evaluate the composition of photographic prints (see Appendix E for "General Criteria for an Acceptable Print.") C-10
•Brainstorm and list on the board the many technical and compositional errors that detract from a "good" photograph. C-11

Suggested Student Activities	Resources and References
	•Missouri Introduction to Industrial Technology Guide, 1988, pp. 45-50. •Missouri exploration of Industrial Technology Guide, 1988.
•Participate in a class demonstration reviewing the variables related to exposure control and the camera adjustments available to coordinate these variables. In groups of three or four, expose and process several rolls of film illustrating the variables of exposure control and document the variable settings used for each exposure (film speed, shutter speed, lens opening, available light, etc.) C-4	•Missouri Exploration of Industrial Technology Guide, 1988, Lesson IV-4, "Continuous Tone Photographic Symbols/Messages". C-4 •Texas, Communication Systems Guide, pp 73-75. C-5
•With specified theme as the subject, expose a roll of black and white photographic film applying two or more principles of photographic composition in each exposure. C-5	
•Use the criteria for evaluating prints and judge prints from magazines and newspapers. Draw a conclusion about their composition. C-10	
•List and discuss the many errors normally made when attempting to produce a fine photograph. C-11	•Upton, Photography "Seeing Photographically," pp 327-348. C-10

Content	Teachers' Plans and Activities
C. Equipment and Materials 1. Cameras 2. Lens and Filters 3. Lights and Meters 4. Enlargers and Contact Printers 5. Film Processors 6. Film 7. Processing Chemicals 8. Holography 9. Radiography and Thermography	•Review "the Structure of Photographic film," (see Appendix D). C-2 •Review and assign TAM#5,"Pinhole Camera" •Review "Procedure for Developing 35mm Roll Films" (see appendix). C-6 •Review TAM#:6 "Processing Transparency Film" (Slides)"; demonstrate transparency processing. C-16 •Use chalks of different color and board draw the layers of transparency film. C-17 •Demonstrate the use of flash. C-13
D. Applications 1. Recording of History 2. Education 3. Recreation 4. Advertising 5. Decoration 6. Entertainment 7. Persuasion 8. Other	•Search your library for articles about famous photographers, discuss the similarities and differences of their work. C-19

Suggested Student Activities	Resources and References
•Read "The Structure of Photographic Film." C-2	•Richter, "The Structure of Photographic film", Appendix D,pp.1-3. C-2
Following the instructor's demonstration, complete TAM# 5,"Pinhole Camera".	•Yates, Ben. TAM# 5, "Pinhole Camera"
•Review the procedure for developing black and white film. C-6 •Complete TAM# 6, "Processing Transparency Film (Slides).	•Richter, " Procedure for Developing 35mm Roll Films", Appendix C, pp.1-3. C-6 •Bonsal, Janet. TAM# 6 "Processing Transparency Film" (Slides).
•Plan a photo essay consisting of at least three prints; expose, process, mount, and display prints of the photo essay. C-9 •Working with a partner and using a theme, expose and develop color transparency film; mount and arrange the resulting images for show; prepare a script and present the slide show to the class or a civic group. C-16	•Walker, Exploring Photography, "How to Display Photographs," pp. 181-187. C-9 •Upton, Photography, "Serving Photographically" pp. 327-348. C-10 •Upton, Photography "Lighting," pp. 259-290. C-13
•Draw the layers of transparency film, label them, and write a sentence telling what they do. C-17	•Upton, Photography, "Color", pp. 221-258. C-16 •Walker, Exploring Photography p. 157. C-17
•Expose (and develop) a roll of film using a flash attachment. C-13	
•Working with a partner and using a theme, expose and develop color transparency film; mount and arrange the resulting images for show; prepare a script and present the slide show to the class or a civic group. C-16	• Eastman Kodak Co., Photo Reports Make it Happen. Booklet AT-5. C-19
•Participate in a field trip to a photographic studio, a presentation by a photographer, or a panel discussion with several persons employed in photography. In a follow-up class discussion review the applications of photography and the impact of photography on society. C-19	•Upton, Photography, "Photographers at Work," pp 1-28. C-19

Content

E. Impact
  1. Expand Time, Location, and Size awareness
  2. provide personal and historical records
  3. Provide personal enjoyment
  4. Influence Economy
  5. Influence Consumer Choices
  6. Influence Political choices
  7. Potential for Being Abusive/Misleading
  8. Provide for Artistic Expression
  9. Other

Teachers' Plans and Activities

•Engage the class in a discusion of the impact of photography on people historically, currently, and in the future; try an activity where you subtract a photographic system or product from our lives and ask questions like: How would life be different? Who's job would be affected? Who might be hurt? C-24

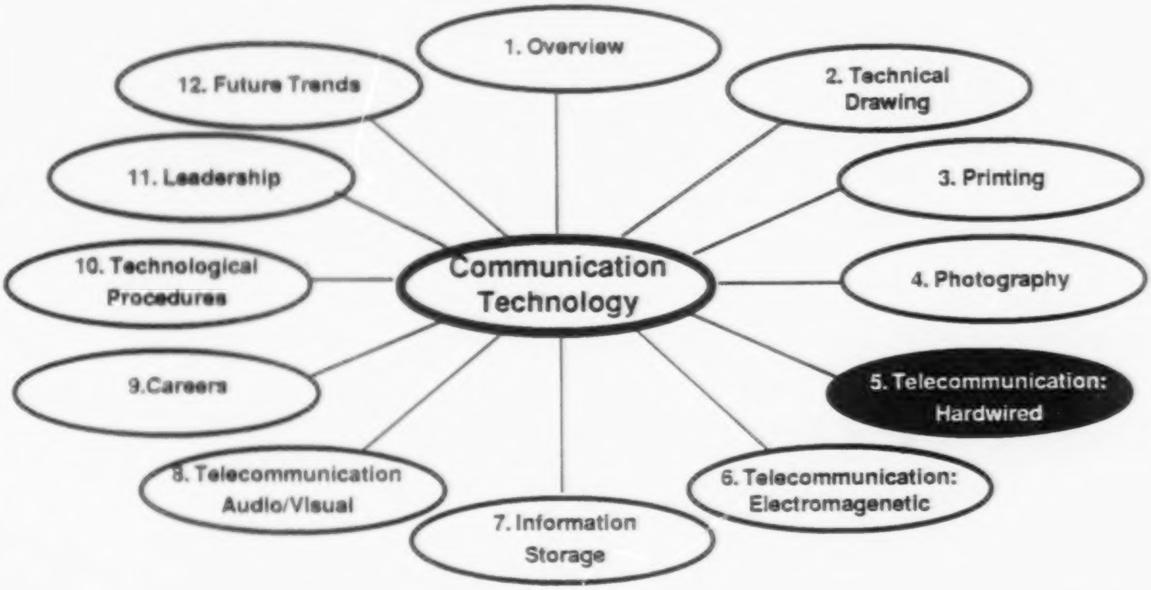
Suggested Student Activities

- Take part in the class discussion on the impact of photography. C-24

Resources and References

Missouri
Communication Technology Guide
Instructor Guide

Unit 5
Telecommunication-Hardwired Systems



1. Overview
2. Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: This unit is designed to equip students with concepts and skills necessary to work in the area of communication technology. It includes the application of skills and concepts learned in earlier *Guides*. In this unit students will develop concepts related to telecommunication systems which use primarily hardwired electrical or fiber optic circuits such as telephone, fax, telecommputing and public address systems. The objectives center on the technological subsystems, equipment and materials, basic principles, applications and impacts. Select and use those competencies appropriate for your local curriculum plans.

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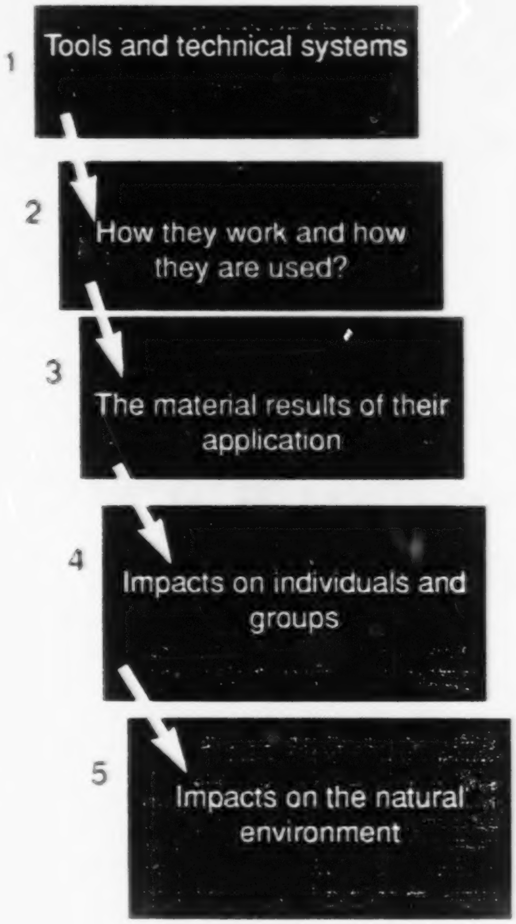
A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1	Tools and technical systems	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	How they work and how they are used?	Examine the scientific and technological concepts that explain how "things work."
3	The material results of their application	Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?
4	Impacts on individuals and groups	Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?
5	Impacts on the natural environment	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 5 Telecommunications-Hardwired Systems

Selected Competencies: The competencies listed below are designed to complement the broad competencies of the Missouri Industrial Technology Guide, 1987, and the broad goals listed at the beginning of this Guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of the following terms as they apply to the telephone: electromagnet, coil, transducer, switch, digital, analog
2. Regularly use terms related to technology along with the proper names of equipment, materials and processes in classroom, laboratory and informal conversations.
3. Sketch the parts of the carbon granule transmitter, label each component and explain how the transmitter operates.
4. Sketch the parts of an electromagnetic receiver, label each component and explain how the receiver operates.
5. Sketch a telephone circuit showing the transmitter, receiver, power source and circuit wiring, label each component and explain how the circuit operates.
6. Explain the linkage between the local telephone service and the long distance service in a selected community.
7. Describe the differences in the telephone systems which have expanded feature capabilities and those which do not.
8. Sketch a public address circuit showing the microphone, speakers, power source, and circuit wiring; label each component and explain how it operates.

Intermediate Competencies

9. Identify , sketch and label the principle components of a fax machine; and explain the function of each subsystem component.
10. Design, send and receive a fax message.
11. Locate and demonstrate the use of a fax machine in your community.
12. Define telecomputing, and describe three advantages it provides.
13. Identify six or more applications of telecomputing, and indicate which ones directly affect you.
14. Name the key components of a telecomputing system including: system operator, modem, personal computer, transmission lines, software and printer.
15. Experience telecomputing by using a personal computer and modem in your school or community by accessing a local bulletin board, and a long distance data base.
16. Explain the importance of the American Standard Code of International Information (ASCII).
17. Compare and contrast fiber optic and copper wire transmission systems.
18. Assemble and explain the electronic principles underlying the operation of a home security system.
19. Identify and discuss new career opportunities that are emerging in the telephony, facsimile and telecomputing fields.
20. Compare the economics and technical efficiency of sending a message by fax versus airmail.

21. Select several of the technical activities completed in this unit and compare them to the concept outline of communication technology in the appendix; find the concepts that best explain the activity.

Content	Teachers' Plans and Activities
V. Telecommunication-Hardwired Systems 1. Telegraph a. History of telegraph b. Encoding/ decoding Sequence c. Transmitter d. Receiver e. Principles of Electrical Circuits f. Principles of Magnetism g. Morse Code	
2. Telephone a. History of telephone b. Terminals c. Transmission links d. Switching operations e. Principles of Circuitry f. Carbon Granule Transmitter g. Electromagnetic receiver	•Sketch and label an assembly drawing of the carbon granule transmitter on the board. Explain its role in a telephone circuit. C-3 •Sketch and label an assembly drawing of the electromagnetic receiver on the board. Explain its role in a telephone circuit. C-4 •Sketch a telephone circuit including the carbon granule transmitter, electromagnetic receiver, power source, and circuit wires on the board. C-5 •Arrange for a guest speaker from the local telephone company to speak to the class. C-6
3. Facsimile Transmission a. Terminals, Sending b. Transmission c. Printers, Receivers d. Principles of Operations	•On the chalkboard, draw and label a sketch of the sending and receiving units of a facsimile system. Show a complete circuit with the units in place. C-9 •Assign a project in which class members design a message to be faxed to another location. Select a minimum of 4 different graphic media and have students include these on the designed message. C-10 •Ask students to visit a business in your community that uses a fax machine. Enquire if students may send their messages with it. Select a destination from which the messages can be retrieved. C-11

Suggested Student Activities

- Sketch or draw an assembly drawing of the carbon granule transmitter, label each component and explain how the transmitter operates. C-3

- Sketch or draw an assembly drawing of the electromagnetic receiver; label each component and explain how the transmitter operates. C-4

- Install telephone wiring and test a telephone circuit.

- Sketch or draw a telephone circuit showing the transmitter, power source, circuit wiring, and receiver; label each component and explain how the circuit operates.
- Procure discarded carbon granule transmitters and electromagnetic receivers from the local telephone company. Using stereo or discarded radio speakers and a six volt battery assemble and solder a telephone circuit. C-5

- Participate in presentation by guest speakers from the telephone company related to (a) the linkage between local telephone service and long distance service; (b) the expanded feature capabilities in telephone service; (c) the use of fiber optics in telephone communication. C-6.

- Make a copy of the Teacher's chalkboard sketches of the fax system subsystems. Label the principle component parts and be prepared to explain the function of each. C-9

- Design, create and fax a message. C-10

- Locate and use a fax machine in your school or community. C-11

Resources and References

- Exploring Technology Education Videos, Section B, Communication.:
  Program I-B "Introduction to Communication"
- Compton's Encyclopedia Volume 20, pp.56-61, Texas, Communication Systems Guide, pp.17-19A; Jones, Discovering Technology Communication, pp 244. C-3

- Compton's Encyclopedia, Volume 20, pp. 56-61.

- Choice #84 "Telephone and Cable TV Installer Activity." Learning Concepts, 1631 DeVoe Dr., Lincoln, Nebraska 68506. C-4

- See Appendix G: "Elements of a Simple Telephone Circuit". C-5

- Harms, Communication Technology Activities, p.15-20.
- Utah, Industrial Arts-Agriculture, p. "Laser/Fiber Optic Communication".
- Hacker, Living with Technology, p.200-201 C-6

- Crass and Raizman, Networking: An Electronic Mail Handbook, pp. 77-80;

- Connel and Galbraith, Electronic Mail, pp.31-50 C-9

Content	Teachers' Plans and Activities
4. Telecomputing a. Personal Computer b. Modem c. ASCII code d. Transmission links e. Software f. Electronic bulletin boards and data bases.	•Assist students in finding a definition of telecomputing and related terms. •Review and Assign TAM #7, "On Line Computer Communication." C-14, C-15 •Read and Assign TAM #2, "Using ASCII for Computer Telecommunication." C-16 •Review and Assign TAM#8, "Laser Applications (Communication, Warning and Security Devices)." C-17 •Review and assign TAM#9, "Fiber Optics: The New Rays."
5. Public Address a. History of Public Address System b. Microphone c. Speakers d. Principles of Circuitry	•Discuss how a public address system works. C-7 •Review and assign TAM#10, "Intercom Systems." C-8
6. Electrical Warning Devices a. History of Electric Warning Devices b. Vehicular Warning Devices c. Building Warning Devices d. Other Warning Devices e. Principles of Circuitry f. Encoding/Decoding Sequence	•Review and Assign TAM#11, "Home Security Monitoring Systems." C-18
B. Applications 1. Scheduling for Railroads 2. Western Union 3. FTD Florists 4. Military Strategy 5. Business/Personal Correspondence 6. Amplify Sound to Large Groups. 7. Other	•Help students relate several of the activities completed in this unit to the concept names that explain them (See Appendix: "Concept Outline of CommunicationTechnology." C-21

Suggested Student Activities	Resources and References
•Read,"Telecommunications and Telecomputing."	•Costello, "Telecommunications and Telecomputing," Appendix; L-12
•Complete TAM#7 ,"On Line Computer Communications." C-14, C-15	•Bernagozzi,Adrian TAM#7, "On-line Computer Communications." C-14,C-15.
•Complete TAM#2 , "Using ASCII for Computer Communications." C-16	•Kahoe,Dick. TAM#2, "Using ASCII for computer communication". C-16
•Complete TAM:#8 ,"Laser Applications (Communications, Warning and Sensing Devices)" C-17	•Adams,Craig" TAM#8 "Laser Applications(Communication, Warning and Sensing Devices)"
•Complete TAM#9 ,"Fiber Optics:The New Rays"	•Costello, Don. TAM#9 ,"Fiber Optics: The New Rays".
	•Cross and Raiznian, Networking: An Electronic Mail Handbook, pp.93-115. C-14 •Mayer, The Electronic Mailbox, pp. 1-40. C-14
	•McAleese, The Laser Experimenter's Handbook , "Laser Projects ", pp.103-141; •Shields, Laser Optics and Communication, Brodhead Garrett Co., Cleveland, Ohio. C-17
•Sketch or draw a public address circuit showing the microphone, speakers, power source, amplifier,and circuit wiring. Label and explain how each component works. C-7	
•With the directions of your teacher complete TAM#10 " Intercom Systems." C-8	•Carter,Ed. TAM#10 ,"Intercom Systems." C-8
•Complete TAM#11,"Home Security Monitoring Systems." C-18	•Ash, Lynn, TAM#11,"Home Security Monitoring Systems." C-18
•With the help of the teacher select several of the technical activities in this unit and compare them to the concept outline of communication technology in the appendix. Find the concept that best explains the activity. C-21	•Hendricks, Communication Technology, p.318-327. C-21

Content

C. Impact
1. Provide Instantaneous Telecommunication
2. Provide cultural Exchange
3. Influence the Economy
4. Provide Personal Touch
5. Led to Further Inventions
6. Provide a Measure of Security/Safety
7. Other

D. Careers

Teachers' Plans and Activities

•Ask students to solve the problem: Which is cheaper, airmailing or faxing a message? Be sure to include fixed costs (price of fax machine, secretaries desk, chair, typewriter, for mail preparation, etc.) and variable costs (long distance fees, stamps, etc.) in the calculations. When would it be cost effective for a person or business to purchase a fax machine? Make an assumption about the volume of messages sent per year. C-20

Suggested Student Activities	Resources and References
•Calculate the cost of faxing a message to a location in a foreign country or another continent. Calculate the cost to send the same message by air mail. Compare the efficiency of both methods. When would it become cost effective to install a fax machine? C-20	•Use any economics test that defines fixed and variable costs. C-20
•Select and research a job in the field of telephony, facsimile transmission, telecomputing or postal service. Write a one page report. C-19	•See school or community library: Dictionary of Occupational Titles, U.S., Government Printing office, Washington D.C., 1977. C-19

Missouri
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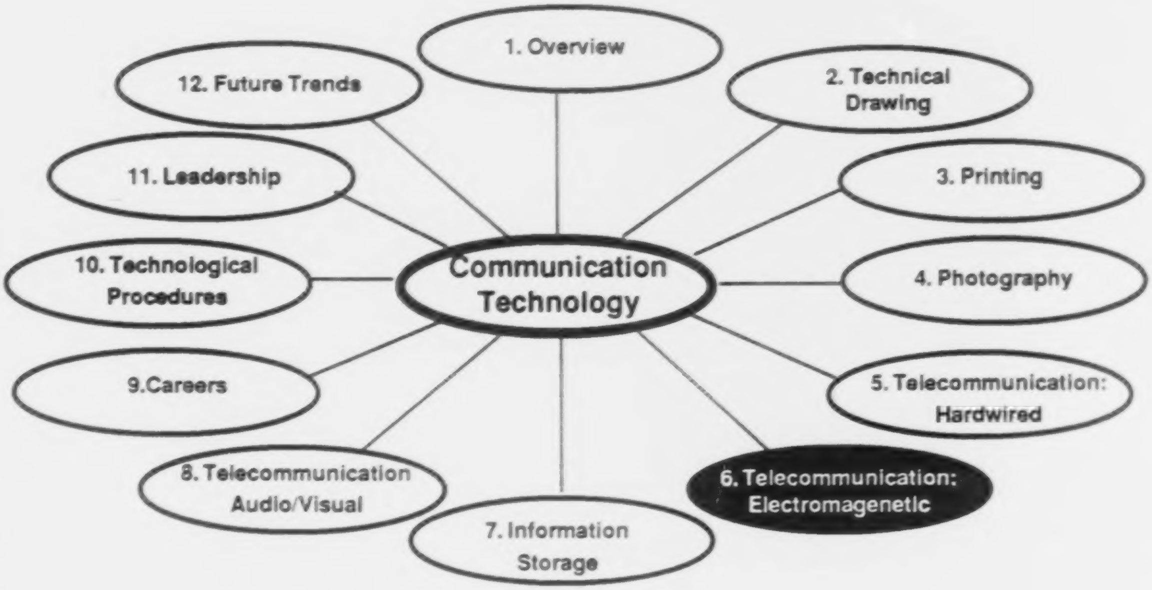
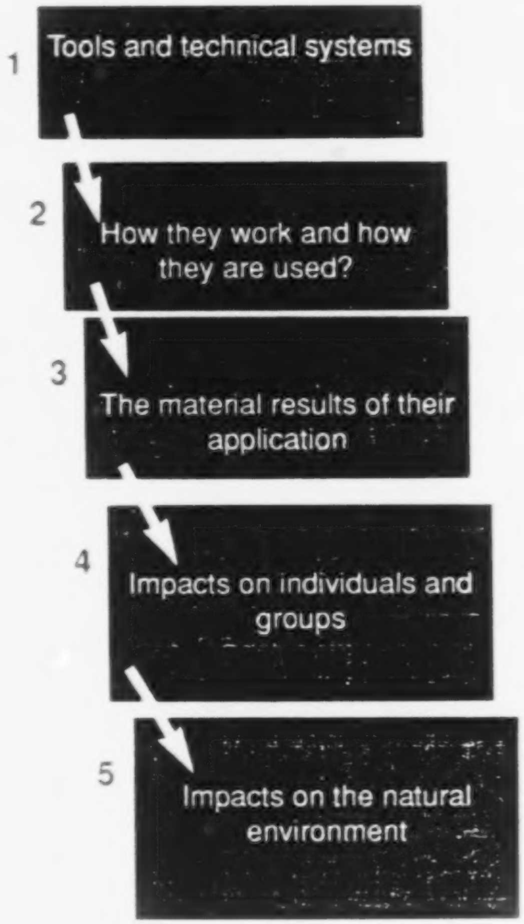
Unit 6
Telecommuncation -Electromagnetic Systems


1. Overview
2. Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: The objectives listed in this unit are built upon those listed in the *Missouri Introduction to Industrial Technology Guide*. In this unit students will review and further develop the fundamental concepts and skills related primarily to radio communication. Students will work on objectives dealing with the wireless telegraph, AM-FM radio, radar and sonar systems, including the electromagnetic spectrum, and how these systems impact on everyday life. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1
Tools and technical systems
2
How they work and how they are used?
3
The material results of their application
4
Impacts on individuals and groups
5
Impacts on the natural environment

Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.

Examine the scientific and technological concepts that explain how "things work."

Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?

Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?

Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 6-Telecommunication-Electromagnetic Systems

Selected Competencies: The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Guide, 1987, and the broad communication goals at the beginning of this guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of: Volt, ampere, Ohm, Hertz, Henry, Farad.
2. Regularly use terms related to technology along with the proper names of equipment, materials, and processes in classroom, laboratory and informal conversations.
3. For each of the following electrical concepts, state the corresponding electrical unit of measure: electrical push, electrical current, electrical resistance, inductance, capacitance, and frequency.
4. Explain each of the following electrical concepts: radio transmitter, electromagnetic signal, radio receiver, tuning circuit, amplifying circuit, alternating current, direct current, and piezoelectric effect.
5. Sketch a simple radio circuit using standard schematic symbols for: antenna, inductor, capacitor, ground, diode, battery, transistor, resistor, and crystal earphone; label each component and explain how each component functions in the circuit.
6. Construct an electromagnetic audio transmission and/or reception system and test its capability to send/receive signals following proper safety procedures.

Intermediate Objectives:

7. Define the terms electromagnetic transmit, receive, modulation , multiplexing, duplexing and frequency selecting.
8. Explain the difference between pulse modulation, pulse code, frequency, and amplitude modulation.
9. Explain how the frequency spectrum is subdivided into YLF, LF, MF, HF, VHF, SHF, and EHF.
10. Describe the differences of atmospheric patterns of propagated electromagnetic waves.
11. Sketch the block diagram of a wireless telegraph system; label each component and explain its function.
12. Sketch the black diagram of an AM and FM radio transmitter and receiver; label each component and explain its function.
13. Construct a simple FM transmitter.
14. Construct a simple AM receiver.
15. Construct a simple pulse code modulation transmitter and receiver.
16. Explain the principles of SONAR transmission and reception techniques.
17. Explain the principles of RADAR transmission and reception techniques.
18. Identify and list the application of radio communication in everyday life.
19. Identify and discuss the job opportunities in the field of radio.
20. Select several of the technical activities completed in this unit and compare them to the concept outline of communication technology in the appendix. Find the concept that best explains the activity.

Content	Teachers' Plans and Activities
A. Electromagnetic Audio Transmission/Reception Systems 1. Wireless Telegraph a. Transmitter b. Receiver c. Principles of Radio Wave Transmission d. Morse Code	•Find, discuss and quiz the students on definitions of important radio communication terms.
	•Read The Story of Radio or similar publication to gain an orientation to the development of this technology. C-7 •Create a list of radio communication terms and definitions for hand out; ask students to match terms with their definitions. C-8
2. Radio a. Transmitter b. Receiver c. Principles of Radio Wave Transmission d. Voice communication e. AM-FM Signals f. CB's / Mobile Phone	•Draw a block diagram of a wireless telegraph; label each component and explain its function. Ask students to complete the sketch. C-11 •Sketch the block diagram of an AM or FM radio transmitter and receiver; label each component and explain its function. C-12 •Review and assign TAM#12,"FM Transmitter." •Review and assign TAM#13,"Building an AM Radio Receiver."
3. Sonar a. Transceiver b. Principles of Sonar c. Sound In Water	•Locate and show a film/video on SONAR. C-16
4. Radar a. Transceiver b. Principles of Radar c. Inaudible Sound	•Locate and show a film/video on RADAR. C-17
B. Electromagnetic Spectrum	•Sketch the electromagnetic spectrum and discuss how its various parts relate to radio communication; find a picture of the spectrum in the library, and show it in class. C-9
C. Application 1. Information/Entertainment system 2. Portable Telephone 3. Warning device 4. Monitoring Device 5. Medical Diagnostic Aid 6. Other	•Lead a discussion in which students identify the numerous applications of radio transmitter and receivers. C-18

Suggested Student Activities	Resources and References
•Participate in a class discussion about definitions of volt, ampere, Ohm, Hertz, Henry Farad; the development of the wireless telegraph and radio; units of electrical measurement, radio concepts, and electronic schematic symbols. C-7	•Use the Encyclopedia of Science and Technology or others in your local library; •Dunlap, The Story of Radio, or similar books. C-7
•Define the following terms in writing: electromagnetic, transmit, receive, modulating, multiplexing, duplexing and frequency selecting. C-7	
•From a written list of descriptions select the best explanation for pulse modulation, pulse code, frequency and amplitude modulation. C-8	•Sands, 101 Questions and Answers about Fixed Radio communications. C-8
	•Rosenthal, Fundamentals of Radio; Orr, Radio Handbook.
•Sketch the block diagram of a wireless telegraph system; label each component and explain its function in writing. C-11	
•Sketch the block diagram of an AM or FM radio transmitter and receiver; label each component and explain its function in writing. C-12	
•Construct a simple FM transmitter. C-13	•Homily, Clarke, TAM#12, "FM Transmitters."
•Construct a simple AM Receiver. C-14	•Richter, Jerry, TAM#13, "Building and AM Radio Receiver."
•Construct a simple pulse code modulation transmitter and receiver. C-15	
•View a film or video depicting how sonar works. C-16	•Kock, Radar Sonar and Holography, pp. 48-69. C-16
•View a film or video on RADAR such as Echos of War, NOVA- V1614, Coronet Films, 108 Wilmont Rd., Dearfield,ILL. C-17	•Kock, Radar Sonar and Holography, pp. 72-83. •The World Book Encyclopedia, Volume 16, World book Inc., pp. 78-93. C-17
•Draw the electromagnetic spectrum and highlight the radio frequencies. C-9	•Hacker, Living with Technology, p. 182; •O'Donnell, et al, Radio Station Operation, p.122-137. C-9
•Brainstorm and list as many applications of radio in everyday life as possible i.e.. car radios, garage door openers, air traffic control, CB radio, etc. C-18	

Content

D. Impact
  1. Provide a Measure of Security/Safety
  2. Influence the Economy
  3. Provide Entertainment
  4. Allow Instantaneous Messages
  5. Provide Mass Communication
  6. Potential for being Abusive/Misleading
  7. Provide Cultural Exchange
  8. Other

E. Careers

Teachers' Plans and Activities

•Provide students with a list of job categories in the radio industry. Ask students to select one, research it, and write a brief report. C-19

•Using the concept outline of communication technology in Appendix M, select and discuss a series of concepts that describe the activities in this unit:

Concept	Activity
Formulating	The activity of producing a commercial is an example of formulating.
Composing	Scripting the news is an example
Transducing	An example of this was done when the AM radio earphone changed voice energy to electric energy.
Modulation	This concept describes frequency variation in AM radio
Frequency Selection	The concept was covered during the discussion of the electromagnetic spectrum.
Acoustic Wave Generating	This concept describes how the radio diaphragm in the speaker changed magnetic energy to mechanical (sound) energy. C-20

Suggested Student Activities	Resources and References
•Write an audio script and tape record a 30 second commercial or 3 minute newscast. C-19	•O'Donnell, et al, Radio Station Operation, p.122-137. C-9
•Select and describe in writing, one job you find interesting in the field of radio: station management, programming , sales, news, promotion, billing, production and engineering are a few examples. C-19	•Keith and Krause, The Radio Station, Keller, Film, Tape and TV: "Where Do I Fit In?", pp.1-110. C-19
•Select several of the technical activities completed in this unit and compare them to the concept outline of communication technology in the appendix. Find the concept that best explains the activity. C-20	•Hendricks and Sterry, Communication Technology, "An Introduction to Communication Technology Concepts," pp. 95-114; "Understanding Concepts of Communication Technology," pp.115-186; "A Taxonomy of Communication Technology," pp. 317-327. C-20

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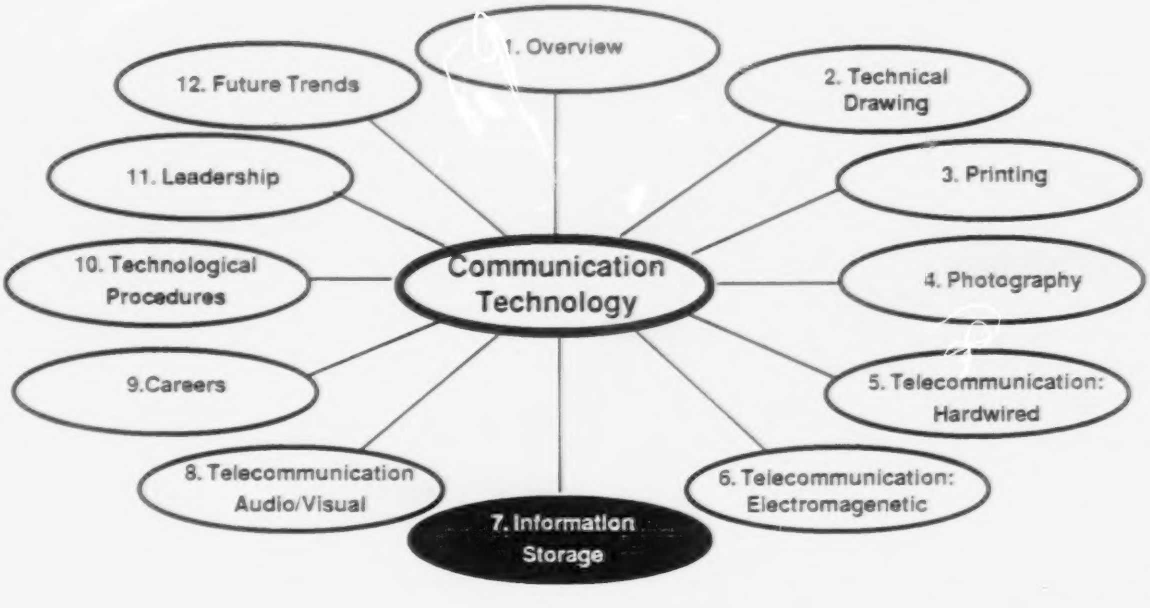
Instructor Guide

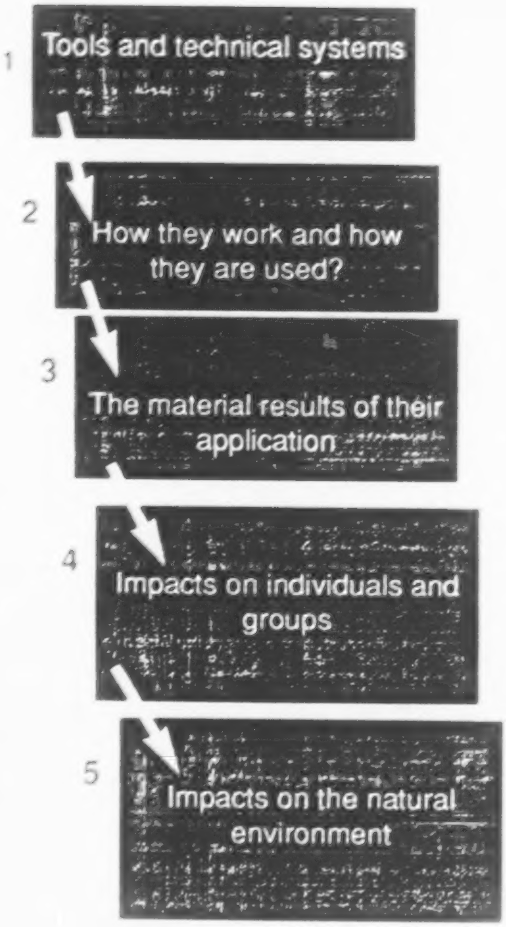
Unit 7
Storage and Retrieval Systems


1. Overview
12. Future Trends
2. Technical Drawing
11. Leadership
3. Printing
10. Technological Procedures
Communication Technology
4. Photography
9.Careers
5. Telecommunication: Hardwired
8. Telecommunication Audio/Visual
6. Telecommunication: Electromagenetic
7. Information Storage

Unit Scope: At any point in the communication process information can be stored for later retrieval. In this unit the beginning competencies are presented as a review of the introductory concepts presented in previous *Guides*. The intermediate competencies center on the various media that have been invented to store information including paper, film, and plastic. Each material employs its own means of retrieving information for later use. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1	Tools and technical systems	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	How they work and how they are used?	Examine the scientific and technological concepts that explain how "things work."
3	The material results of their application	Explore what happens when new communication tools are marketed, and widely accepted. How do things stay the same, and how do they change?
4	Impacts on individuals and groups	Describe what happens when new tools and technical systems are introduced into our homes and work places. How must people change? What new skills must be learned?
5	Impacts on the natural environment	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 7: Information Storage and Retrieval

Selected Competencies: The Competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals at the beginning of this Guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of: recording disk, magnetic tape, compact disk.

2. Regularly use terms related to technology along with the proper names of equipment, materials and processes in classroom, laboratory and informal conversations.

3. Sketch diagrams which distinguish among mechanical, magnetic and laser recording devices.

4. List or sketch the production sequences necessary to make a commercial quality audio or video recording

5. Plan, record and play back an audio message using a selected audio storage /retrieval system in a correct and safe manner.

Intermediate Competencies:

6. Identify and describe ten information storage devices and verbally describe them.

7. For each identified information storage device, indicate whether it is mechanical, magnetic, optical, chemical or physical in its retrieval principle.

8. Locate and provide examples of the four information storage principles: separating, coating, conditioning and forming.

9. Distinguish the differences among the concepts of indexing, abstracting, controlling and accessing information.

Content	Teachers' Plans and Activities
A. Historical Systems 1. Music Box (cylinder) 2. Player piano (paper roll) 3. Phonograph 4. Printed page 5. Hollerith cards	•Set up a demonstration and compare the quality differences between an old and a modern information storage medium. C-6
B. Modem systems 1. Mechanical (recording disk) 2. Magnetic (magnetic disk) 3. Laser(optical disk) 4. Chemical (photo-sensitive surface) 5. Physical (printed substrate)	•Assemble and write a glossary of key terms such as magnetic tape, mylar disk, floppy disk, optical disk, and other information storage terms. C-1
C. Encoding and decoding used 1. Energy conversion methods a. Electrical to acoustical b. Electrical to light c. Electrical to mechanical d. Projected light e. Reflected light	•Locate the equipment and help students tape-record a speech, choral group, band concert or other presentation. C-4 •Prepare a list of information storage techniques that operate on a mechanical, magnetic, optical, chemical, or physical principle. Examples include: •Mechanical-Vynil records, Hollerith card •Optical-compact laser disk •Chemical-Photographic film, microfilm •Magnetic-Videotape, floppy disk •Physical-Printed paper, shirts, signs. C-6,C-7
2.Formatting methods a. Records (vinyl) (1.)Monophonic (2.)Stereophonic (3.)Quadrophonic	•Procure a example of a technical drawing, photographic print, videotape, audio tape, floppy disk and vynil record. Discuss how these mediums are organized and formatted to efficiently store information- Formating. Use illustrations, sketches or other props where possible. C-8
b.Disks (mylar) (1)Sectors (2)Tracks (3)Density c.Magnetic tape	
	•Discuss and demonstrate how a telephone answering machine operates; invite a representative from a local business machines store or the telephone company to explain how it stores information. C-5

Suggested Student Activities	Resources and References
•Record and playback an audio message using two or more historical or modern systems and compare the quality of the messages. C-6	•Jones, Discovering Technology: Communication, Activity Guide, pp. 86. C-6
	•Exploring Technology Education Videos, Section B Communication.: Program I-B "Introduction to Communication"
•Read the assigned material related to each concept introduced.	
•Participate in a class discussion reviewing the definition of recording disk, magnetic tape, and compact disk as well as the historical and modern systems of audio storage and retrieval. C-1	
•Create an audio or video recording of student speeches, choral groups, bands, or presentations by guest speakers and students in technology classes or create an audio recording depicting a given theme or situation. C-4	
•In groups of 2, select an information storage and retrieval medium: books, posters, Hollerith cards, punched tape, videotape, audio tape, floppy disk, photographic negatives, compact disk, etc. Bring either pictures or the storage medium, itself to class. Identify the principle that makes the storage system work: Is it mechanical, optical, magnetic, chemical, or physical? Explain the method used to retrieve information from the storage medium. C-6,C-7	•Consult The New Encyclopedia Britannica, 15th. ed., Chicago, 1988: For example: •"Magnetic Recording", Vol. 7, p.682; •"Videocassette Recorder, " Vol.12, p.354; •"Magnetic Recording," p. 682, Vol. 7; •"Storage," p. 643-645, Vol.16; •"Video Disk Systems," p. 355, Vol.12. C-6,C-7
•Define the term "formatting." Identify the similarities and differences in the format of various information storage mediums. Include a description of the formatting techniques used on drawing, photographic print, video tape, audio tape, floppy disk and vynil record, in the analysis. C-8	
•Participate in a demonstration/ discussion of a telephone answering machine and operate it in a small group activity. C-5	•Jones, Discovering Technology: Communication, Activity Guide, pp. 91, and Hacker, Living with Technology, pp. 210. C-5

Content	Teachers' Plans and Activities
d. Film (1) Composing (2) Exposing (3) Scaling (4) Filtering (5) Cropping (6)Mounting	•Review and assign TAM#6, "Processing Transparency Film "(Slides).
e. Paper (and other substrates) (1) Locating (2) Scaling (3) Perspective	•Review and assign TAM#5,"Pinhole Camera."
D. Equipment and Materials 1. Mechanical systems 2. Magnetic systems a. Recording heads b. Playback heads c. Magnetic tapes d. Reel to reel e. Cartridge f. Cassette g. Magnetic disk	•Prepare a set of overhead transparencies that show examples of the retrieving functions of indexing, accessing, controlling, and abstracting. C-9
3. Optical systems a. Laser recorders b. Laser disks c. Laser disk Players.	•Search for diagrams of magnetic, laser, and mechanical recording techniques in your library. On a chalk board diagram and explain these techniques. C-3

Suggested Student Activities	Resources and References
•Complete TAM#6, "Processing Transparecy Film "(Slides).	•Bonsal, Janet.TAM #6, "Processing Transparency Film "(Slides).
•Complete TAM#5,"Pinhole Camera."	•Yates, Ben. TAM #5, "Pinhole Camera."
•Define in writing the words: indexing, accessing, controlling, and abstracting. Compare on a chart(See appendix K for example), the indexing, accessing, controlling and abstracting systems of the school library's card catalog with similar systems that are used in a personal computer; or in the Encyclopedia Britannica, 15th. ed.; or in the automatic teller at a local bank.	•Hendricks and Sterry, "Retrieving",Communication Technology, pp 173-178. C-9 •See "Decoding," Concept Outline of Communication Technology", in Appendix M C-9 •Hendricks and Sterry, "Decoding," Communication Technology, pp.178-185 C-9
•Select and examine information storage systems to determine the technical process used to retrieve and decode information: Does it do so by: Converting electrical to acoustical energy? Converting electrical to light energy? Projecting light? Reflecting light? Select one and describe the process. C-9	
•Sketch diagrams of mechanical, magnetic and laser recording techniques and describe the differences among these techniques. C-3	•Keith and Krause, The Radio Station, pp 186-193; •Herbvert, Classroom Activities Communication, "Acoustic Storage and Retrieval Systems and Processes", pp 1-4. C-3

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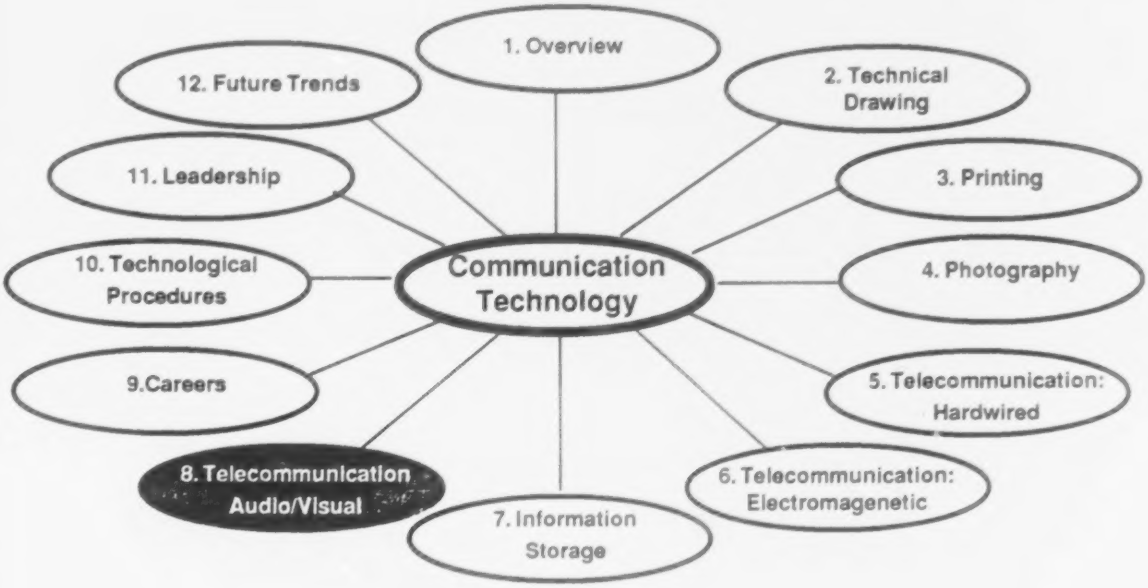
Unit 8
Telecommunication -Audio/Visual Systems

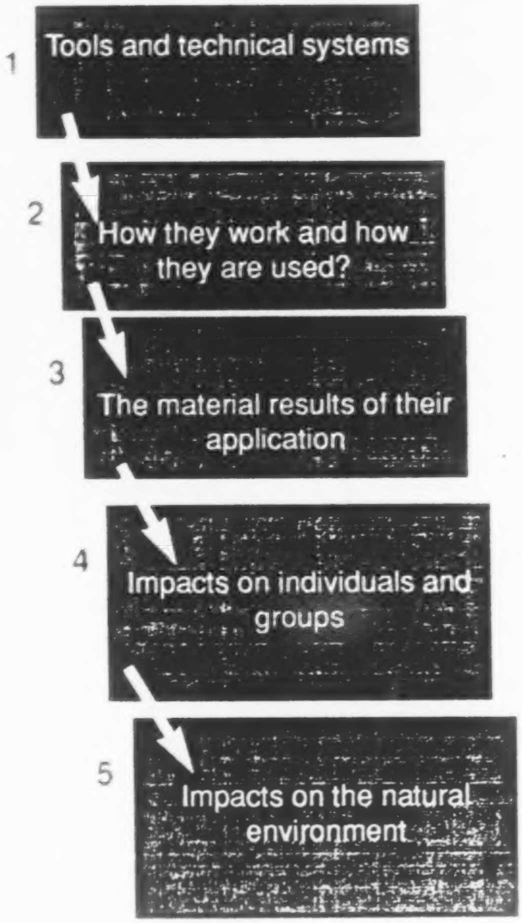

Communication Technology
1. Overview
2. Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends

Unit Scope:

This unit is designed as an expansion of the two previous guides (*Exploration and Introduction to Technology*). The objectives and activities printed here are based on the *Exploration of Technology Guide*. The unit centers on the television industry and emphasizes terminology, technical operation, directing, producing, editing, careers, impacts, regulation and future developments in the industry. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.


1
Tools and technical systems
2
How they work and how they are used?
3
The material results of their application
4
Impacts on individuals and groups
5
Impacts on the natural environment

Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.

Examine the scientific and technological concepts that explain how "things work."

Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?

Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?

Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit -8 Telecommunication-Audio/Visual Systems

Selected Competencies: The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987 and the broad communication goals at the beginning of this guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of: screen resolution, vidicom tube, scanning, video signal, phosphors, cathode ray tube (CRT).
2. Regularly use terms related to technology along with the proper names of equipment, materials, and processes in classroom, laboratory and informal conversations.
3. Sketch a diagram of a television system including camera, network limbs, and receiver set; label each component and explain how the system operates.
4. List or sketch the production sequence used for producing and transmitting a television message.
5. Sketch and describe how the three basic colors used in color television are "mixed" into other colors, tones and shades.
6. Write, produce and record a television segment.

Intermediate Competencies:

7. Write short paragraphs describing how television receiver components work including chemical phosphors, mask, primary colors, electron gun, 525 lines and scan rate.
8. Describe in writing and with illustrations how a television camera changes reflected light into electromagnetic signals for transmission.
9. Compare the tuner, speaker and cathode ray tube of a receiver; explain how they are similar and how they are different.
10. Illustrate how television pictures can be stored on videotape.
11. Sketch the transmission of television signals via satellite including: TV station, ground line, ground station, ground line TV station, transmitter, home TV aerial.
12. Compare the advantages and disadvantages of satellite vs. cable transmission of television signals.
13. Distinguish the differences among producing, writing, directing, performing, researching, staging and editing processes.
14. In writing, describe the importance of lighting techniques, talent selection, camera operation, picture composition, switching devices for instantaneous editing, and studio control equipment.
15. Plan, write, and videotape a television commercial.
16. Identify and describe the job rates of the camera person, director, floor manager, light and sound engineer, front person, production assistant, control desk and talent.
17. Find examples in newspaper and magazine articles that discuss the positive and negative social impacts of television media.
18. Demonstrate a beginning knowledge of either legal, regulatory or ethical practices in the television industry.
19. Identify three probable new developments in television technology.
20. Select several of the technical activities completed in the unit and compare them to the concept outline of communication technology in the appendix; find the concepts that best explain the activity.

Content	Teachers' Plans and Activities
Combined Optical/Acoustical (Audio/VisualSystems) A. Television 1.Transmission / Reception a. Frequency bands (1.) Ultra High Frequency (UHF) (2.) Very High Frequency b. Network links (1.) Microwave (2.) Satellite (3.) Closed-Circuit Cable (4.) Closed-Circuit air	•Locate and ask a television engineer or service person to demonstrate how television cameras and receivers work. Ask the speaker to explain several key components such as chemical phosphors, mask, electron gun, and scan rate. Prepare questions on note cards; give one to each student and require that they ask the question, or a related one of their choosing. C-8, C-9
2. Storage and Retrieval a. Video Cassette recorder b. Laser video disk c. Teletext/videodisk	•Locate and show a film that depicts how reflected light can be changed to magnetic spots on video tape. C-10
3. Production Sequence a. Design Audio/Visual Story board b. Audition / Casting c. Schedule / Produce	•Review and assign TAM #14"Video Syncracies" or assign a similar production project. •Locate, select and show one or more videos such as those shown in the resource column. Direct students in the use of the problem solving process to design an ad. C-15

Suggested Student Activities	Resources and References
•Participate in a class discussion with a guest speaker, such as a television engineer or repairman, related to the parts of a TV camera and receiver set and how they work. C-8, C-9	•Worksheet and discarded, but operating, television camera and receiver sets with accompanying repair/instruction manuals. Illinois, Communication Guide, pp.29-30; •Jones, Discovering Technology Communication, pp. 248-250; •Zettl, Television Production Handbook, pp. 32-33. pp. 55-56. C-9, C-10
•View a film that shows how information can be stored on video tape in the form of magnetic spots, make written notes on the important points. C-10	•Classroom Activities in Communications, "Acoustic Storage and Retrieval Systems and Processes", Wisconsin Department of Public Instruction, pp. 1-4. C-10 •Grob, Basic Television and Video Systems, p. 10 •Zettl, Television Production Handbook, pp. 273-276. C-10
•Using the teacher's directions, complete TAM#14 "Video Syncracies." •Use the problem solving method (see Unit 10, "Technological Procedures") to design a 30 second television advertisement to sell a new food product to young people between the ages of 15 and 21. Record pictures with an 8mm home movie camera, according to a prepared script. C-15	•Allen, Mike. TAM#14, "Video Syncracies." •Millerson, The Technique of Television Production, pp. 321-326. •Kovac, Preparing for Production: Write the Script and Production Sheets, Center for Implementing Technology Education, Dept. of Industry and Technology, Ball State University, Muncie, IN 47306. •"Making a Live TV Show", Video, Pyramid Publishers, Box 1048, Santa Monica, CA 90406. C-15
•Work in small groups to produce a 30-60 second television commercial for a new product. •Set up and tape a Phil Donohue-type talk show; invite a speaker as a guest star. •Write and tape a news program for the school including all of the parts of a typical news story (headlines, events, sports, weather).	•Available video resources: "Planning and Preparing for Production" "Video Post-Production" "Putting Your Production on Screen" "Performing on TV" "Production Tips", Magnetic Media Division, 3M Center, P.O.Box 33975, St. Paul, MN 55133. •"Studio Teacher, Part-1, Great Plains, 1800 N. 33rd. Street, P.O. Box 80669, Lincoln, Nebraska 68501. •Illinois, Communication Technology Guide, p.29. •Fales, Technology Today and Tomorrow, pp. 113-118. •Bame, Exploring Technology Activity Manual, pp. 155-158. •Harms, Communication Technology Activities, pp. 33-40.

Content

- d. Prepare stage/Set
  - (1.) Lighting
  - (2.) Cameras
  - (3.) Sound
  - (4.) Props
  - (5.) Scenery
  - (6.) Special effects
- e. Practice/ Rehearse
- f. Produce the Message
  - (1.) Publish
  - (2.) Record
  - (3.) Develop/Print
  - (4.) Edit
  - (5.) Finish
  - (6.) Process
  - (7.) Other
- g. Deliver the message
- h. Market the product
  - (1.) Promote/Advertise
  - (2.) Sell

4. Basic Principles
   - a. Camera Operation
   - b. Lighting
   - c. Sound
   - d. Stage Preparation
   - e. Message Design
   - f. Signal Transmission
     - (1.) Audio signals
     - (2.) Video signals
   - g. Satellite Relay
   - h. Microwave relay
   - i. Signal Reception
   - j. Video Recorders

B. Audio-Visual projectors
   1. Types of Projectors
      - a. Motion Picture/ Film
      - b. Slide/cassette
      - c. Other
   2. Basic Principles
      - a. Audio Signals
      - b. Video Signals

C. Videophones
   1. Equipment Components
      - a. Touch-tone telephone
      - b. Control Unit
      - c. Display Unit
      - d. Service Unit
   2. Basic Principles

Teachers' Plans and Activities

•Prepare a handout that directs students to draw the network of electronic components that make up a television system. The components should be named and defined; students should place them in correct sequence beginning with the TV station, and ending with the home TV receiving set. C-11

•Create and handout a list of key terms relative to television production that apply to the tools and equipment in your school setting; these terms could deal with lighting techniques, camera operation, talent selection, picture composition, switching devices, studio control equipment, producing, writing, directing, researching, staging editing. C-13, C-14

Suggested Student Activities

- Draw a sketch of a simple Television system.

Resources and References

Content	Teachers' Plans and Activities
D. Applications 1. Education/ Information 2. Medicine 3. Industry 4. Entertainment 5. Advertisement 6. Motion Study 7. Other	•Organize and set up rules for a class debate. Divide the class into two groups, those supporting the first amendment right of free speech and those concerned about the "damage" being done to the people by "deceptive" advertising. C-18 •Ask students to prepare and give a three minute talk to the class on a futuristic technological innovation in the area of television technology. C-18
E. Impacts 1. Influence the Economy 2. Informed Public 3. Influence Consumer Choice 4. Potential for Being Abusive/Misleading 5. Influence Use of Personal Time 6. Increased Social/Cultural Exchanged 7. Provide Personal Enjoyment 8. Other	•Ask students to find magazine articles that discuss the positive and negative social impacts of television and motion picture media. In the course of the ensuing discussion ask students to define what they mean by the terms "positive" and "negative".
F. Careers	•Assign students the task of writing a one page report on a selected job in the television or film industry. Describe the job's duties, required education and training, employment outlook, and expected starting income.

Suggested Student Activities

- Take part in a class debate. Argue the merits of free speech versus the "damage" done by "deceptive" advertising. Arguments could include an interpretation of first amendment rights and an interpretation of "deceptive advertising".
- Select one of the following three technological innovations, prepare a three minute speech on how it works and what type of impact it will have on people in the future: videophones, wristwatch TV, or three dimensional television (holovision).
- Find and bring to class magazine articles that discuss the negative and positive social impacts of television and motion picture media. Especially find articles that discuss the effects of violence and sex in movies on children and teenage viewers.

- Select, research and write a one page report on one of the following jobs: Camera person, director, floor manager, light and sound engineer, front person, production assistant, control desk operator, talent or other job.

Resources and References

- School and local libraries, especially check the Reader's Guide to Periodical Literature.

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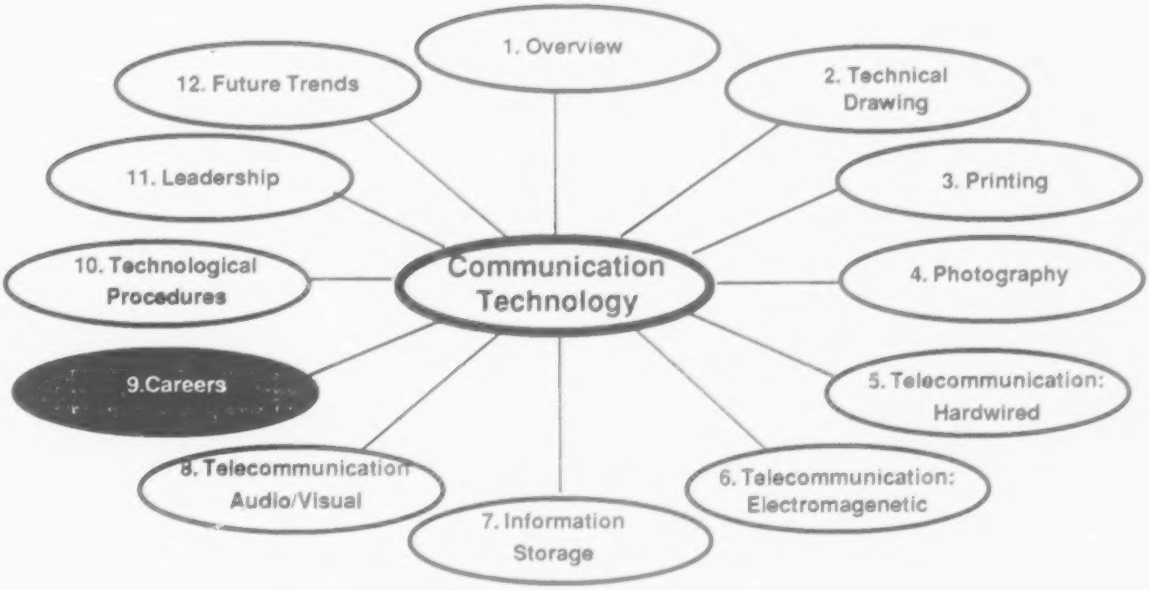
Unit 9
Careers in Communication Technology


Communication Technology
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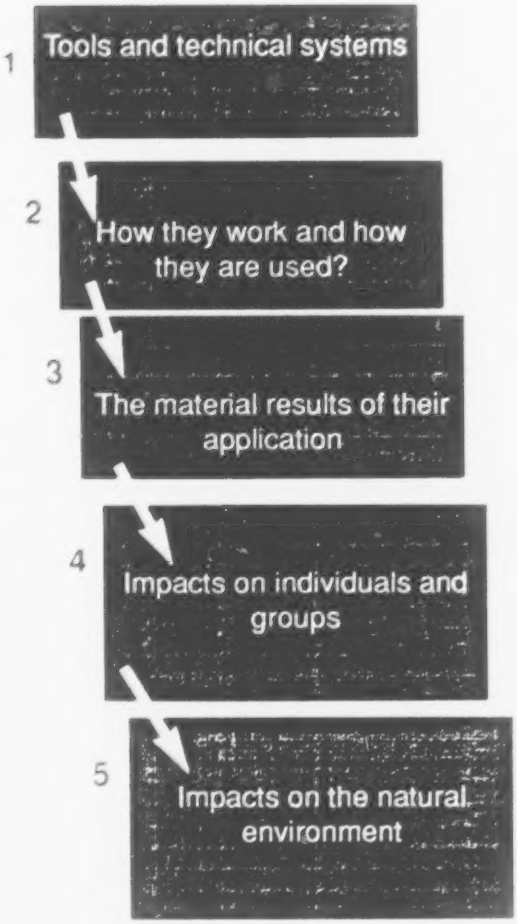
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends

Unit Scope: The purpose of this unit is to examine a range of issues related to careers in the fields of communication technology including job skills, job requirements, trends and opportunities. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.


1
Tools and technical systems
2
How they work and how they are used?
3
The material results of their application
4
Impacts on individuals and groups
5
Impacts on the natural environment

Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.

Examine the scientific and technological concepts that explain how "things work."

Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?

Describe what happens when new tools and technical systems are introduced into our homes and work places. How must people change? What new skills must be learned?

Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 9: Careers in Communication Technology

Selected Competencies: The competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals at the beginning of this Guide.

Competencies:

1. Complete in writing an interest or aptitude assessment scale and have it scored.
2. With the help of a guidance counselor, interpret the results of the assessment scale.
3. Using the Occupational Outlook Handbook and a selected job category, record its description, demand, beginning pay, necessary training and outlook for the future.
4. Identify employment opportunities in the local area.
5. Visit a company or organization, interview a person working at a job of interest.
6. Plan a systematic process for finding a job.
7. Write a resume' using proper English and grammar.
8. Complete a job application using proper English and grammar.
9. Interview for a job.

Content

A. Personal Assessment
  1. Personal Skills
  2. Personal Interests
  3. Personal Aptitudes
  4. Potential Skills

B. Career Exploration
  1. The Process
    a. Awareness
    b. Exploration
    c. Preparation
    d. Updating
  2. The Content
    a. Personal characteristics
    b. Technological trends
    c. Industry trends
    d. Local/Regional trends
    e. Educational preparation

Teachers' Plans and Activities

•Include career and exploration information at appropriate points throughout the entire communication technology course. C-1

•Arrange for students to take the Strong Vocational Interest Inventory, Armed Services Vocational Aptitude Battery, or The Self-Directed Search: a Guide to Educational and Vocational Planning or other assessment tests C-1

•Match your perception of a student's skills with their self-perception of them. Discuss these with the student. C-2

•Create a bulletin board of jobs in communication technology, include part-time and summer jobs opportunities. C-3

•Read "Fifty Job-Related Student Activities." C-3

•Request that the guidance councelor come to class to explain how students might identify and explore a career field right for them. C-6

•Using an Occupational Outlook Handbook have students select a communication occupation of interest to them. C-6

Suggested Student Activities	Resources and References
•Take the vocational interest inventory available at your school's guidance department. C-1 •Complete TAM #15 "Job Hunting Skills"; discuss the results with the instructor. C-2	•Consult the school guidance counselor. C-1 • Stephens, Dan.TAM# 15,"Job Hunting Skills." C-2
•Contribute to the careers bulletin board by bringing to class a job advertisement on a communication job of interest to you. C-3 •Select and do one or more of the following : •Review the want-ads under "help wanted " in newspapers. Make a list of 10 types of occupations that are in demand, and answer these questions: What employers need these skills? Where are the jobs located? How much do they pay? C-3 •Making a list of the advantages and disadvantages of the occupation selected by: •Visiting a local employment agency or state employment service and determine the kinds of occupational openings, work requirements, wages and training necessary. •Ask your state job service to provide information on how their job referral system works. •Spend time observing or shadowing a worker in an occupation you are interested. •Visit a local job site such as construction project, plant, government agency or other organization and observe what tools and equipment are being used, and what workers are actually doing. C-6	•Available newspapers and trade journals. C-3 •Burns, William E. Industrial Education, " Fifty Job-Related Student Activities", October, 1980, pp.16-19. C-3 •School library newspapers. •"From Job Hunting to Moving Up", 6 videos, AMS, 1987. C-6 •Occupation Outlook Handbook. •Activities for the Occupation Outlook Handbook, 1989. C-6

Content	Teachers' Plans and Activities
C. Employability Skills 1. Job seeking Skills a. Applying for jobs b. Interviewing for jobs c. Resumes' d. References e. Negotiation f. Evaluation jobs	•Discuss key job seeking skills with students. Employ role playing activities to answer questions similar to these: How do you apply for a job over the phone? How do you answer a want-ad? How do you interview for a job? How should you dress for an interview? What information should be included in a resume? Are there any techniques to make interviewing easier? How is a job application form completed? What is a personal reference? What is the proper etiquette? What criteria should be used to evaluate job offers? C-8 •Assign students the task of writing a one page resume' C-7
2. Interpersonal Relationship Skills a. Willing to follow directions b. Punctual c. Reliable d. Cooperation with co-workers e. Shows initiative f. Demonstrate respect for others g. Self-directed h. Dependable i. Able to communicate j. Persevering k. Willing to learn l. Accept and use criticism m. Personal Hygiene	•Search the school's film library for a film or video that emphasizes "knowing what it takes to hold a job. Stress the skills necessary for keeping a job. C-8

Suggested Student Activities	Resources and References
•With the help of another adult (teacher, parent, etc.) set up and role play a job interview . Video tape and view it, evaluate the strengths and weaknesses of the interview. C-8	•Missouri Introduction to Materials and Processing Technology Guide, 1989, Unit 7, "Careers in M& P Technology." •See " Sample Interview Questions," " Tips on Interviewing" and "Resume' Checklist" in Appendix H, I and J. •Fan, The workbook: Getting the Job You Want, 1987. C-8
•Write a simple resume, use the model in TAM #15, "Job Hunting Skills", as an example. C-7	•See example resume in TAM #15. C-7
•View a film or video that identifies and demonstrates on-the-job survival skills. Make a list of the interpersonal relationship skills observed. C-8	•"On-the-Job Survival Skills" (30 min Video) Sunburst Communications, 1982. •Como, Surviving on the Job, 1986. •"Jobs of the 90's " (48 min video), Sunburst Communications, 1987. C-8 • Exploring Technology Education Instructional Materials, Section B. Communication.: Program IV-B "Evaluating Messages"

Content	Teachers' Plans and Activities
D. Occupations and Skill Levels 1. Classes of Occupations a. Technical Drawing b. Photography c. Graphic Arts (Printing) d. Telecommunications e. Radio f. Television g. computer	•Organize the range of career opportunities in the communication industries. Classify these into skill levels and levels of the technological continuum. C-4
2. Skill Levels a. Management b. Supervision c. Skilled d. Semiskilled 3. Technological Continuum a. Scientist b. Engineer c. Technologist d. Technician e. Trades person f. Semiskilled g. Unskilled	•Lead students in a brainstorming session. Identify and list names of jobs in the communication industries. Classify these as service or production jobs. Draw a conclusion: Where are the most job opportunities ? C-4
E. Careers and Technological Trends 1. Communication 2. Service 3. Sales 4. Management 5. Labor 6. Research & Development 7. Resources 8. Emerging occupations	•Select a local communication industry i.e. newspaper, telephone company, photographer, and invite a member of management, union member, and nonunion person to share their perspectives on work. C-4 •Compare and contrast the career opportunities in the field of communications in small towns vs large towns. C-4

Suggested Student Activities	Resources and References
•Review books in the school library that identify and describe various jobs in the communication industries. C-4	•Kuenstler, The Desk Guide to Training and Work Advisement, 1988. (See especially photography, film, TV, Video and graphics). C-4
•Prepare a report that describes the training required for the job selected from the Occupational Outlook Handbook. C-4	•Mitchell, The Work Book: A Guide to Skilled Jobs, 1978. or similar books. C-4
	•Contact your area Chamber of Commerce. C-4

Content

F. Education and Training
  1. On-the-Job training
    a. Apprenticeships
    b. Journeyman
  2. Technical training
  3. Professional education
    a. Scientist
    b. Engineer
    c. Technologist
    d. Teacher
  4. Vocational Education
    a. Technician
    b. Skilled Trades
    c. Semiskilled trades

G. Entrepreneurial endeavors
  1. Opportunity
  2. Advantages/Disadvantages
  3. Requirements.

Teachers' Plans and Activities

•Identify and contrast "sunrise" vs. " sunset" industries. Assign students the task of finding examples of jobs that are becoming extinct and examples that are new and emerging ones. C-3

•Find and present various educational and training opportunities for careers in communication technology. C-6

•Ask a recent alumni of your program to visit and speak to the class about their current educational experience and how it relates to their present job. C-6

•Describe the vocational/technical and professional training programs related to communication technology that are available in the area. C-3

•Invite a successful entrepreneur to speak to the class on what it is like to be in business for yourself. C-3

Suggested Student Activities

- Identify two jobs that have become extinct. Identify two jobs that are new and emerging occupations; in a 3-5 minute speech present these to the class. C-3
- Telephone or interview people working in jobs in the communication field and chart the in-service training in which they participate. C-6
- Participate in career day opportunities provided by colleges or technical schools in your area. C-3
- Identify and describe the characteristics of a free enterprise system; ask a successful entrepreneur how these relate to his/her business.
- Describe the various types of business ownership i.e. sole proprietorship, partnership, corporation, cooperative, etc. C-3
- Discuss and come to a class consensus about the key characteristics of a successful entrepreneur. C-3

Resources and References

- "Career Futures," Career Information Services, Inc., 42 Powder Horn Hill, Weston, Ct. C-3

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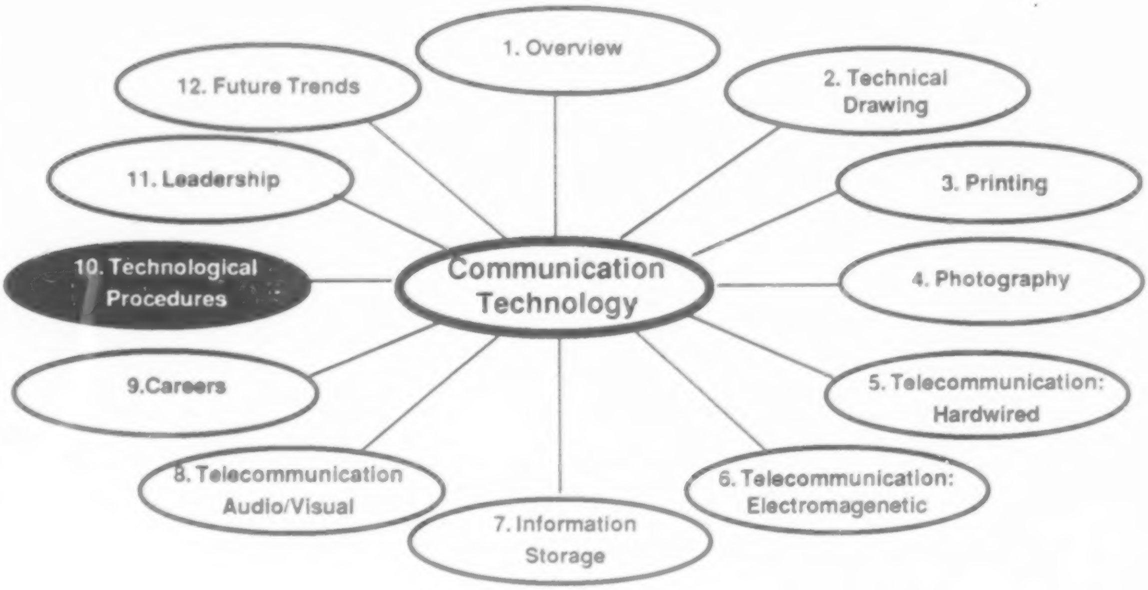
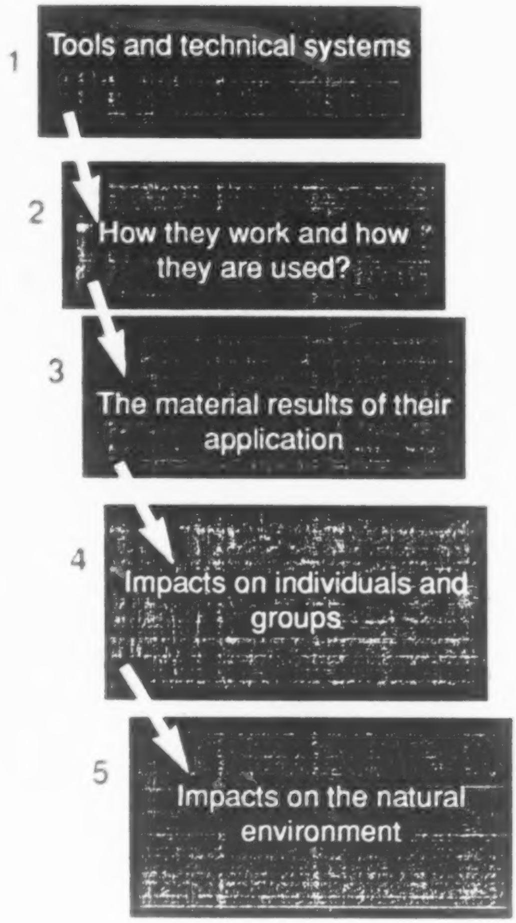
Unit 10
Technological Procedures in Communication Technology


1. Overview
2. Technical Drawing
3. Printing
4. Photography
5. Telecommunication: Hardwired
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: This unit is designed to acquaint students with some of the broad procedures associated specifically with communication technology, and with technology generally. Topics in this unit include problem solving, technology assessment, and regulatory agencies. The activities involve problem solving techniques, comparing communication standards, designing assessment procedures, relating technological change to social change, modeling and experimenting.Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1	Tools and technical systems	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	How they work and how they are used?	Examine the scientific and technological concepts that explain how "things work."
3	The material results of their application	Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?
4	Impacts on individuals and groups	Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?
5	Impacts on the natural environment	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 10: Technological Procedures

Selected Competencies: The selected listed below are designed to support the broad competencies of the Missouri Industrial Technology Guide, 1987, and the broad communication goals at the beginning of this Guide

Competencies

1. Draw a model that depicts the major component parts of any technical communication system, define and give examples for each component part of the model.
2. Relate activities done in selected communication industries to local, state and national developments.
3. Identify, name and explain the major regulatory mechanism of selected communication industries.
4. Solve communication technology problems through the technique of formal problem solving.
5. Demonstrate the safe use of tools and equipment.
6. Design and test a systematic procedure for purchasing a product, ensuring the maximum value at the least cost.
7. Design a procedure for technology assessment.
8. Experiment with processes, equipment and materials to develop insight into new and advancing technologies.

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Content	Teachers' Plans and Activities
A. Context of Communication technology 1. Relationship to Industrial Technology a. Materials and Processing Technology b. Energy and Power Technology c. Communication Technology 2. Technology Generally a. Industrial b. Aviation c. Medical d. Military e. Others	•Discuss the relationship of the content groups of technology: communication, materials,and processing, and power and energy. Make comparisons relative to the following: •Purpose of each group of technologies. •Definition of each group. •How each content group "overlaps" the others. •How the groups are inter-dependent •Identify specific technologies that are examples of each group, or combination of groups. •Draw conclusions. C-2
B. Terminology 1. Types of Terms a. Jargon b. Trade/Technology specific c. Vernacular (everyday) d. Organizational 2. Historical Terms 3. Conventional Terms 4. Emerging Terms	
C. Applications of technical Communication Systems 1. Industrial 2. Aviation 3. Medical 4. Military 5. Other	•Conduct a technological assessment of a selected product or technical system. Ask the questions: a. What is the purpose for using the technology? b. What are the technological options? c. Is the new technology feasible? d. Is it economically viable? e. How does it impact on the environment? f. How does it impact on people? g. How does it fit people's values? h. What is the preferred option? i. What impacts on affected parties? j. Which option is acceptable? C-7
D. Regulation and Standardization 1. Federal Communication Commission 2. ANSII 3. American Standard Code for Information Interchange	•Identify and compass three regulatory agencies in the field of communication. These might include the Federal Communication Commission(FCC),the American Standard Code for Information Exchange (ASCII), the International Standards Organization (ISO) or the American National Standards Institute (ANSI). Stress the need for standardization of communication systems. C-3

Suggested Student Activities

•Find and bring to class pictures of technical systems or products that fall primarily into one group, and pictures of things that fall into 2 or 3 groups of technologies simultaneously.C-1

•Conduct a technological assessment of a selected new product or technical system. Answer these questions:

a. What is the purpose for using the technology?
  b. What are the technological options?
  c. Is the new technology feasible?
  d. Is it economically viable?
  e. How does it impact on the environment?
  f. How does it impact on people?
  g. How does it fit people's values?
  h. What is the preferred option?
  i. What impacts on affected parties?
  j. Which option is acceptable? C-7

•Write a one page paper comparing two regulatory (standards) organizations answering the following questions:

  Who are they?
  What do they do?
  Why were they established?
  How do they set industry standards? C-3

Resources and References

•DeVore, Technology: An Introduction.

Available newspapers and magazines that can be cut apart, especially Time, U.S. News and World Report, and Newsweek. C-1

•Hetman, Society and the Assessment of Technology.

•Schwing and Albers, Societal Risk Assessment, "Trade Offs", pp. 129-140. C-7

Content

E. Problem Solving in Technology (The Technological Method)
  1. Identify the Problem
    a. Analyze the Problem
    b. Analyze the Problem's Context
    c. Define and Clarify the Problem
  2. Establish Solution Criteria
    a. Identify Appropriate Criteria
    b. Identify Constraints and Limitations
    c. Weight Criteria According to the Nature of the Problem
    d. Develop a Design Brief
  3. Assemble Relevant Information
    a. Search for Information
    b. Analyze Information
    c. Synthesize Appropriate Information
  4. Formulate Alternative Solutions
    a. Identify and Remove Barriers to Creativity
    b. Brainstorming
  5. Evaluate Alternatives
    a. Apply Solution Criteria
    b. Select Optimum Solution
  6. Implement Prototype Solution
    a. Develop Prototype Solution
      (1.) Produce Drawing
      (2.) Theoretical Testing
    b. Plan Implementation of Solution
    c. Implement Prototype Solution
    d. Evaluate Prototype Solution in Operation
  7. Refine Solution
    a. Communicate the Solution
    b. Refine the Prototype Solution
    c. Implement the Refined Solution
    d. Monitor the Solution on an Appropriate Basis

Teachers' Plans and Activities

•Review and use the "problem solving technique" with the class. Present a problem like:" Using only the tools and materials provided in a kit, create a communication system that transmits information over "x "distance, without noise, and in darkness."

• Prepare students to solve the problem. Lead a discussion in the application of problem solving in every day life, the cyclical, yet flexible nature in the sequence of steps in problem solving, and the importance of creativity in the process. Point out and explain the steps in the problem solving process, See E, Content Outline. C-4

•Prepare kits filled with selected materials and parts that could be used to build some type of communication apparatus. Materials might include: wire, string, screws, wood, glue, design materials, paper, electromagnetic receiver, carbon granule transmitter, 6 volt battery, light bulbs, etc. C-8

•Select and assign a limited number of tools to be used in the activity. Give appropriate demonstrations in the safe use of the tools, i.e. soldering, use of saws, shears, safety glasses, etc.

•Prepare worksheets involving the generation of creative ideas; prepare students for home work assignments throughout the lesson, lead discussions on using the worksheets.

•Discuss the principle of brainstorming, and prepare students to apply them. Set limits on the time students have to construct and experiment with the invented communication system (prototype).

•Have student groups demonstrate their communication system prototypes against the design criteria established earlier. Award a prize to the group with the best solution. C-5

•An alternative to the design problem above is to: "Design and test a systematic procedure for purchasing a product-- television, tapedeck, radio, automobile--ensuring the maximum value at the least cost." C-6

Suggested Student Activities	Resources and References
•Using only the materials and tools in the kits provided, create a communication system that transmits information. Follow the design criteria provided by the teacher. Use the problem solving technique. C-4 •Observe and follow the safety procedures demonstrated by the instructor. Use the appropriate tools to safely construct a communication system prototype. C-5	•Wales, The Guided Design Approach. •Koca, Mark.TAM#16,"Problem Solving Through Graphic Design." •"Guided Design," free film available from: Film Scheduling Center, Modern Talking Picture Service, Inc, 2323 New Hyde Park Rd., New Hyde Park, N.Y. 11040; •Page, Problem Solving, pp. 10-17. C-4
•With the teacher's help use the problem solving technique presented and develop a method for purchasing a product such that the maximum value is attained for the least cost. C-6	•Locate and review the pertinent issue of Consumer Reports in which the selected product is systematically and objectively appraised. C-6

Content

F. Impact of Communication Technology
  1. Individual
    a. Advertising
    b. Education
    c. Entertainment
    d. Persuasion
  2. Societal
    a. Democracy
    b. Free Market
    c. Political Parties
    d. Religious change
  3. Environmental
    a. Noise Pollution
    b. Visual Distraction
    c. Solid, liquid, gaseous pollution
    d. Wildlife Impacts

Teachers' Plans and Activities

•Identify and discuss how innovations in communication fields have changed people locally; and throughout the nation and world. Examples might include:

- •What did the invention of electrostatic copying machines (xeroxing) do to the copyright laws?
- •How did the invention of "roll film" make photography available to everyone for the first time?
- •How has the cam corder and video tape made it difficult for dictators to rule countries without criticism?
- •How has the invention of "fiber optics" changed surgery in the medical profession?
- •What technical inventions made it possible to build personal computers? C-2

Suggested Student Activities

- Find and bring to class a copy of a magazine or newspaper article that discusses the affects of new inventions on people i.e. their laws, beliefs, customs, traditions, or language.

  Make a list of 50 words that have entered the English language because of new technology. C-2

Resources and References

- Applied Science and Technology Index.
- Readers Guide to Periodical Literature. C-2
- Exploring Technology Education Videos, Section B. Communication.:
  Program IV-B "Evaluating Messages"

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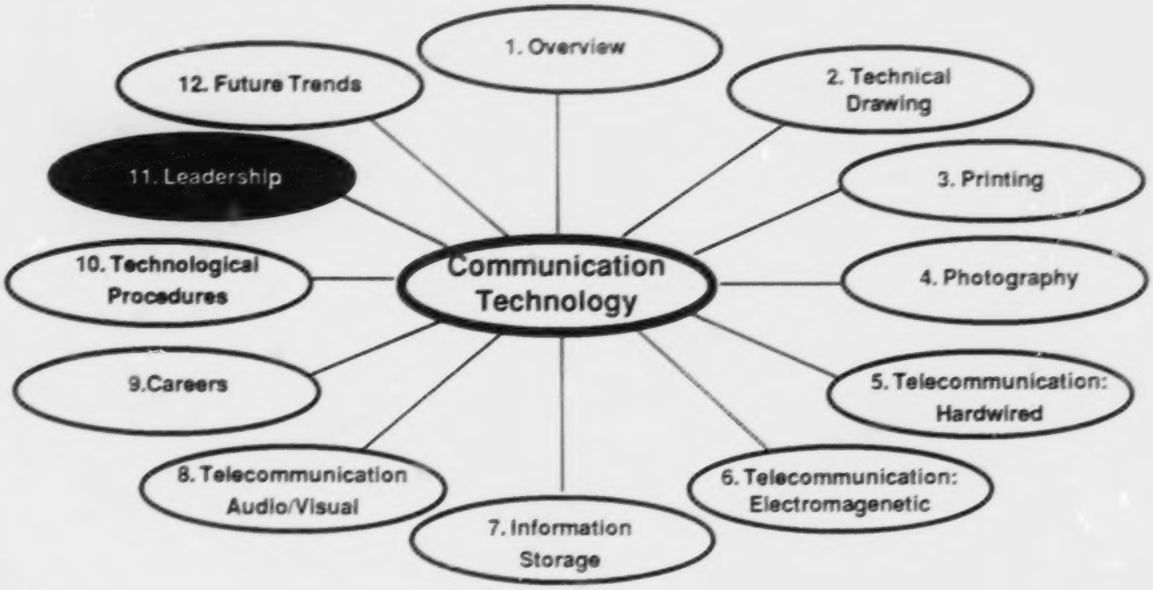
Unit 11
Leadership in the Communication Fields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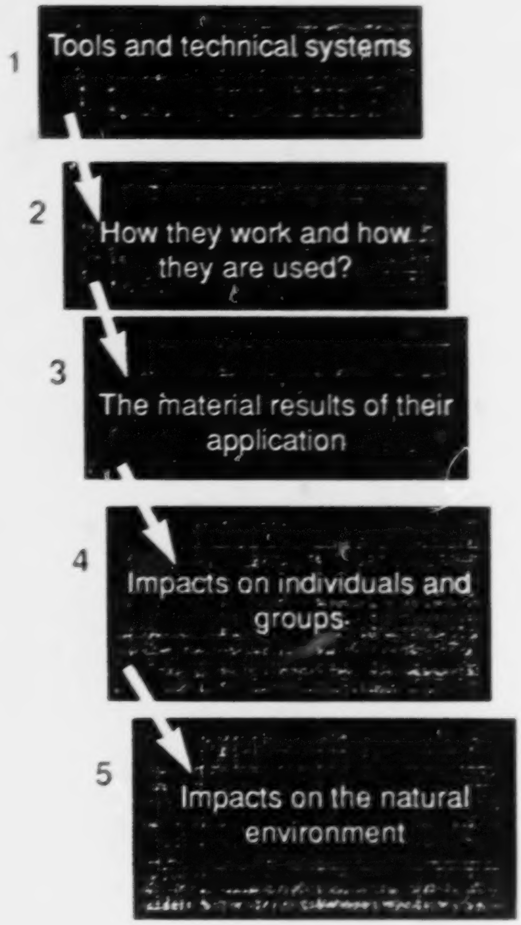
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecommunication Audio/Visual
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: The purpose of this unit is to help students discover their own characteristics and abilities related to leadership. It will allow students to explore their own strengths and limitations and develop skills of group leadership. Opportunities will be provided to give students the chance to participate in leadership roles. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.


1
Tools and technical systems
2
How they work and how they are used?
3
The material results of their application
4
Impacts on individuals and groups
5
Impacts on the natural environment

Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.

Examine the scientific and technological concepts that explain how "things work."

Explore what happens when new communicaton tools are marketed, and widely accepted. How do things stay the same, and how do they change?

Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?

Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 11: Leadership in Communication Technology

Selected Competencies: The competencies listed below are designed to complement the broad competencies of the Missouri Industrial Technology Guide, 1987, and broad goal #7 listed at the beginning of this Guide.

Beginning Competencies:

1. Identify the personal characteristics necessary to play a leadership role in the fields of communication technology.

2. Identify and discuss the important leadership qualities displayed by contemporary leaders in communication technology.

4. Describe and illustrate qualities contributing to effective leadership.

5. Demonstrate leadership in an individual activity related to the class.

6. Perform the officer duties in guiding a student organizational activity.

7. Work cooperatively with others in a followership role.

8. Demonstrate persistence by bringing group activity to a successful conclusion.

9. Describe the benefits of student organization activity.

10. Participate effectively in a local, state and /or national club.

Content	Teachers' Plans and Activities
Leadership in Communication Technology A. Characteristics of Effective Leadership 1. Characteristics of Leadership 2. Motivation and Leadership 3. Examples of Leadership	•Identify six or more leaders in the communication fields. These can be either historical or contemporary figures. Thomas Edison, George Eastman, Samual Morse, James Clerk Maxwell, Marconi, Alexander Graham Bell, Theodore Vail, Judge Harold Green, are examples. Assign students the task of researching these leaders. Ask students to list examples of positive and negative leadership qualities these people exhibited. Make a chart with leaders' names listed down the left side and leadership qualities across the top. Place check marks under these qualities as they are identified in the ensuing class discussion about each leader. Count the number of check marks under each quality and draw conclusions. C-2
B. Individual Leadership 1. Know personal strengths and limitations 2. Validate how others see you 3. Consistency 4. Dependability 5. Initiative 6. Sense of Purpose	•Initiate and act as a sponsor to a club or student technology education association. C-1
C. Group Leadership 1. Inspire Confidence 2. Resolve conflict 3. Communicate Effectively 4. Evolve vision of goal(s) 5. Organize resources effectively 6. Manage operation	•Review and role play Roberts Rules of Order with students; apply the rules to club meetings. C-5
D. Student Organization Activities 1. Purpose 2. Key National Organizations a. Technology Student Association b. Vocational Industrial Clubs of America c. Epsilon Pi Tau d. Junior Achievement e. Trade/ Professional Organizations 3. State and Local Organizations a. Missouri Industrial Technology Student Association	•Encourage student membership in national student organizations such as TSA, FHA, FFA, VICA,DECA, FBLA, etc. C-7 •Encourage student leadership in the Missouri student Technology Association. C-10 •Involve students in completion events at local, regional, state and national levels. C-6 •Form an honor society. C-4 •Form a local technology club, devise a constitution and by laws. C-8

Suggested Student Activities	Resources and References
•Each student or pair of student researches the leadership qualities of their selected (or assigned) leader. Typical qualities to make note of might be how the leader: 1. Inspired confidence 2. Engendered loyalty 3. Worked with groups 4. Was liked by subordinates 5. Gave credit to subordinate 6. Manage people 7. Set an example 8. Was liked by family members 9. Delegated responsibility 10 Other qualities C-2	•Encyclopedias and bibliographies in the school or local library. •Hart, Missouri Industrial Technology Student Guide, 1987. •Diversified Technology, Effective Leadership Modules, C-2
•Form a club such as a photography club, computer club, etc.; elect officers and appoint committee chairpersons. C-1	•Liebers, Lieber's Guide: How to Organize and Run a Club, 1977. Walfers, Organizations, Clubs, Action Groups: How to Start Them, How to Run Them, 1980. C-1
•Assume responsibility for making arrangements for a class visit to a communication industry such as a newspaper, TV studio, photography studio, drafting department, telephone company, etc. C-5	•Local area telephone books. C-5
•Participate in a meeting using Roberts Rules of Order. C-5	•Robert, Henry M. III, Robert's Rules of Order Newly Revised. 1984. C-5
•Help to organize a technology club and carry out a club sponsored service workday for an organization or group in your community. C-8	•TSA, Technology Student's Association Member Guide, (n.d.). C-7
•Participate as a member. C-7	
•Run for national or state office in a student technology organization. C-10	•National Vocational-Technical Honor Society P.O Box 1265, Grambling, SC 29348. C-4
•Enter a Missouri Industrial Technology Education Association Awards Program Student Association competition. Participate in local and regional events, especially drafting, photography, and graphic arts events. C-6	•TSA, TSA competitive Events Guidelines, 1988. C-6

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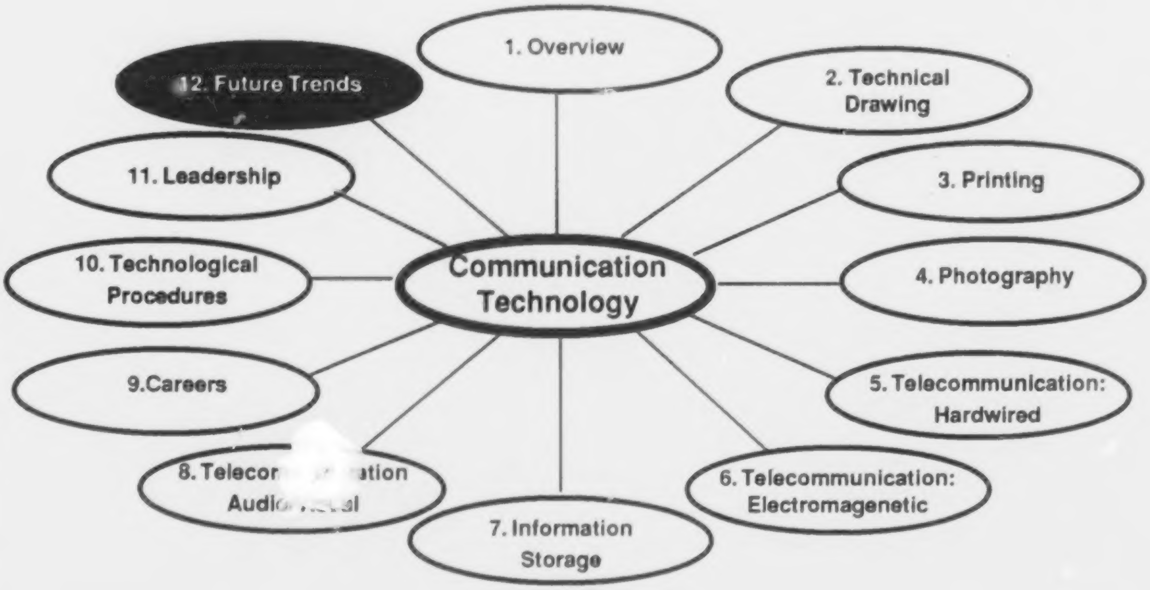
Unit 12
Future Trends in Communication Technology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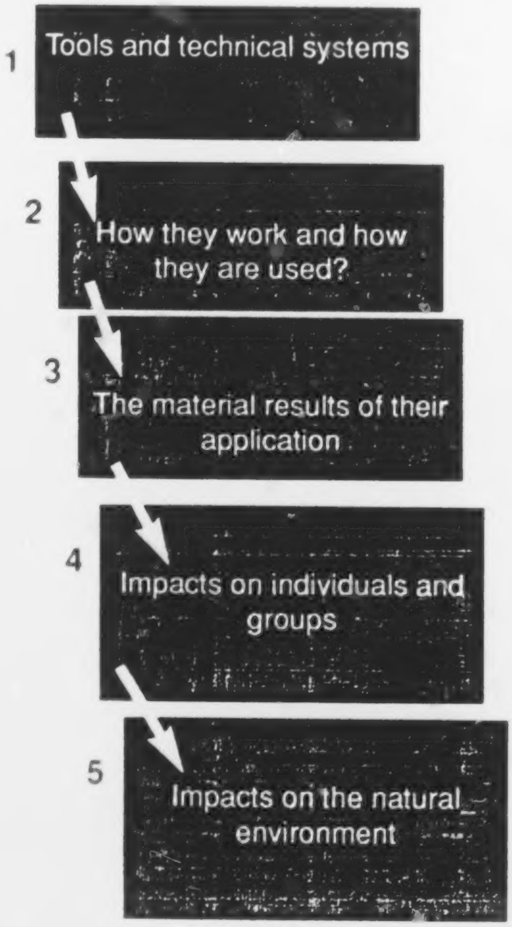
6. Telecommunication: Electromagenetic
7. Information Storage
8. Telecom[illegible]ation Audio[illegible]
9.Careers
10. Technological Procedures
11. Leadership
12. Future Trends
Communication Technology

Unit Scope: This unit is designed to stimulate thinking about the future of communication technology and the impacts that new technical systems will have on the lives of people. Both the positive and negative impacts of new technological devices can be explored. Select and use those competencies appropriate for your local curriculum plans.

A General Plan for Teaching Technology

The illustration below is a generalized plan for creating lessons and planning curriculum for technology education. Other plans for structuring information about communication technology are also reasonable and valid. Select and use a plan that works in your school environment.



1	Tools and technical systems	Examine and compare the many current and emerging communication tools, both individually and how they work within larger technical systems.
2	How they work and how they are used?	Examine the scientific and technological concepts that explain how "things work."
3	The material results of their application	Explore what happens when new communicaton tools are marketed and widely accepted. How do things stay the same, and how do they change?
4	Impacts on individuals and groups	Describe what happens when new tools and technical systems are introduced into our homes and work place. How must people change? What new skills must be learned?
5	Impacts on the natural environment	Examine the effects of new tools and techniques on the natural environment. Are species endangered? What do humans gain? What is lost?

Unit 12-Future Trends in Communication Technology

Selected Competencies: The Competencies listed below are designed to support the broad competencies of the Missouri Industrial Technology Education Guide, 1987, and the broad communication goals at the beginning to this Guide.

Beginning Competencies:

1. Define by completing statements with appropriate words or write definitions of closed caption, facsimile, semaphore, Ameslan, signing, Braille.

2. Regularly use terms related to technology along with the proper names of equipment, materials and processes in classroom, laboratory and informal conversations.

3. Identify two visual communication devices/services that have been developed within the past decade, describe subsequent developments which have occurred, and state the current acceptance and uses.

4. Identify two audio communication devices/services that have been developed within the past decade, describe subsequent developments which have occurred, and state the current acceptance and uses.

5. Identify two audio-visual communication devices/services that have been developed in the last decade, describe subsequent developments which have occurred, and state the current acceptance and uses.

6. Identify two integrated communication technology devices/services that have been developed within the past decade, describe subsequent developments which have occurred, and state the current acceptance and uses.

7. Experiment with and /or construct a device using lasers and fiber optics for communication following proper safety procedures.

8. State at least one potential trend in communication technology.

9. Identify a communication device/service in which technological change is occurring, gather pertinent information, and formulate and express an opinion related to the social/cultural issues of this technological change.

Intermediate Competencies:

10. From a list of technical communication systems, provide, select and debate the probabilities that a current technology will be replaced by an "emerging" technology in the communication field.

Content

Potential Trends in Communication Technology

A. Transmission Systems
   1. Fiber optic integrated services digital networks
   2. Expanded cable television
   3. Increased use of satellites
   4. Improved satellite down link receiving antennas
   5. Coaxial cable
   6. "Narrowcasting,"
   7. Mobile communication systems
   8. Electronic mail
   9. Videophone

Teachers' Plans and Activities

•Direct students to make a list of communication devices/services that have been developed within the past decade. Assign the task of writing a two or three page report on the selected topic. C-3,4,5,6.

•Demonstrate how light can be sent through a fiber optic cable using a flashlight. C-4

•Demonstrate how to build a laser/fiber optic voice communication or control device. C-4

Suggested Student Activities

•As a member of one of four groups,each with an assigned topic(video systems, audio systems, audio-visual systems, or integrated systems), make a list of communication devices/services that have been developed within the past decade. Select one of the listed devices/services and write a two or three-page report on the topic. The paper should include a sketch of the device/service, a description of subsequent developments, and a statement of the current acceptance and uses. Be ready to include your findings in a related class discussion. C-3,4,5,6.

•Participate in a class discussion related to the lists of communication devices/services that have been developed in audio systems, video systems, audio-visual systems, and integrated systems. Each student will describe the device/service which is the subject of the written paper. The class will summarize the findings by noting on the lists those devices/services that have undergone further development as well as those that have been widely accepted and used. Complete a worksheet summarizing data related to communication devices/services that have been developed within the past decade. C-3,4,5,6.

•Participate in an experiment sending light through a fiber optic cable using a flashlight. C-4

•Observe a class demonstration reviewing the tools and processes used to build communication and/or control devices incorporating lasers and/or fiber optics. C-4

•Build a laser/fiber optic voice communication or control device. C-4

•Participate in a class discussion led by a representative of the telephone company on the subject of fiber optic systems. C-4

•Select and copy an article from a recent periodical which describes current communication technology. Be prepared to place the article in a bulletin board display or to describe the findings of the article to the class.

Resources and References

•Worksheet related to communication devices/services that have been developed within the past decade. C-3,4,5,6.

•Costello, TAM #9 "Fiber Optics: The New Rays"

•Adams, TAM #8"Laser Applications: Communication Warning and Sensing Devices"

•Utah, Industrial Arts--Agriculture,"Laser/Fiber Optic communication"; Swernofsky, Making Technology Work, p.l 157-158. C-4

Content

B. Display Technology
  1. Liquid crystal display (LCD)
  2. Gas plasma display
  3. High definition TV
  4. Videotext (Videoconferencing: home banking, shopping, education, etc.)

C. Printers
  1. Color laser printers
  2. Three dimensional hard copy-hole
  3. Light emitting diode printers
  4. Liquid crystal shutter printers
  5. Ion-deposit printers

D. Storage
  1. Universal conversion to 3 1/2 "magnetic disk."
  2. Gallium Arsenide disks-virtually unlimited storage capacity.
  3. Read/write optical disks.
  4. Computer software with sound and animation.
  5. Increased use of non-film photography.

E. Microprocessors-"Supercomputers"

F. Software
  1. Artificial intelligence
  2. Expanded expert systems
  3. "Eyedentify" computer security systems

G. Publishing
  1. Expanded desktop publishing
  2. Word processing systems
    a. "What-you -see-is-what-you-get" systems
    b. Code-oriented systems
  3. Decline in print media

H. Impacts
  1. Information technology becomes most important resource
  2. Machine qualities of speed and problem solving become more valued than humane qualities
  3. Computer control of most technical systems. Nuclear weapons, telecommunication, manufacturing, etc.
  4. Re-evaluation of the role of the computer

Teachers' Plans and Activities

•Guide the class through a controlled debate on one of the issues listed below related to emerging technologies. Try the following procedure: Divide the class into halves, one taking the "pro" and one the "con" position. Direct each student to find and bring to class a copy of a magazine article in which the author takes a position on the issue. For instance, for issue #2, ask the "pro" group to prepare 3 strong arguments, with supporting evidence, why electronic mail will replace the present postal system; and the "con"group to prepare 3 arguments why electronic mail will not replace the present postal system.

Establish and explain the rules of the debate before starting the activity. The teacher's roll is to control excitement, maintain fairness, be a moderator, and write a summary of the arguments on the board. One or two impartial students should judge the debate based on the strength of the arguments presented.

Suggested issues for debate:
#1 Desktop publishing will replace the need for the print shop.
#2. Videotext and electronic mail will replace the need for the U. S. Postal System.
#3. Magnetic and optical storage disks will replace the need for filing cabinets.
#4. Videophones will replace the need to travel by automobile.
#5. Computer aided drafting systems will replace the need for traditional pencil and board drafting skills.
#6. Artificial computer intelligence and "expert systems" will replace the need for human thinking.
#7. Fiber optic cable will replace the need for copper cable.
#8. Magnetic image storage will replace the need for photographic film.
#9. Information technology will become a more important resource than energy technology. C-10

•Locate and show a film or video related to new concepts, devices, and services in communication. C-9

Suggested Student Activities

- Participate in a class debate or a selected technological issue related to communication technology. Research the selected issue before taking part in the debate by finding an appropriate article in the school library. C-10

- View a film or video tape related to new concepts, devices, and services in communication. C-9

- Participate in class discussion related to potential trends and current social/cultural issues in communication technology. C-9

- View a film or video tape related to communication satellites. C-9

Resources and References

- Didsbury, jr. Editor, Communication and the Future. See the following articles for ideas:
  - "The Future of Literature," Michael H. Bengal," pp.3-6.
  - "The Future of Global Satellite Communications: Space Odyssey 2000," Joseph N. Pelton, pp. 74-77.
  - "Communication Education for the Twenty-First Century," William Work, pp. 113-132.
  - "Videotex: Blessing or Bane for the Boob-Tube?," Stephen K. Badjik, pp. 123-132.
  - "Telecommunications: the Next Generation," Jenan M. Ciano and Bryan Came, pp. 143-156.
  - "Telecommunications: Alternatives to Transportation," Richard C. Harkness and J. T. Sandal, pp. 227-233.
  - "The Medium in Madness: Television and the Pseudo-Oral Tradition in America's Future." Tony M. Lentz, pp. 332-336.
  - "Future Communications: Problems and Possibilities," S. C. Seth, pp. 345-348.
- Barden and Hacker, Communication Technology, "The Future of Integrated Communication Systems," pp. 406-422. C-10

- Illinois, Communication Technology Curriculum Guide, pp. 55-56; Piel, You, Me and Technology, pp.77-78. C-9

- "Audio/Visual Catalog", Current Edition, National Aeronautics and Space Administration, Marshall Space Flight Center, Marshall, AL 35812. C-9

Section II: Technology Activity Modules

This section contains the seventeen Technology Activity Modules (TAMs) listed below. Each module contains an instructor component and a student component. As opposed to the broad ideas presented in the Instructor Guide, the TAMs are narrow and specific to selected topics. The activities are highly detailed and often, with a minimum of preparation, may be implemented in the classroom and laboratory.

TAM 1. Time Travel-Communication Style
TAM 2. Using ASCII for Telecommunication
TAM 3. CAD
TAM 4. Desktop Publishing
TAM 5. Pinhole Camera
TAM 6. Processing Transparency Film (Slides)
TAM 7. On-Line Computer Communication
TAM 8. Laser Applications
TAM 9. Fiber Optics
TAM 10. Intercom Systems
TAM 11. Home Security Monitoring Systems
TAM 12. FM Transmitters
TAM 13. Building an AM Radio Receiver
TAM 14. Video Syncracies
TAM 15. Job Hunting Skills
TAM 16. Problem Solving Through Graphic Design
TAM 17. Animation

The TAMs listed here are only a few of the many that could be presented. The user of this guide is challenged to identify and create others on technological concepts that would make the study of communication technology more complete.

Technology Activity Module 1

TIME TRAVEL

COMMUNICATION STYLE

by Ron Sorensen

Technology Activity Module 1

Instructor Component

Activity Objectives:

Did you ever wonder where all of the technical things around us came from? Who invented them, and when? The purpose of this TAM is to create a chronologically correct communication Timeline using dates of events and inventions in communication technology from 15,000 B.C. to present.

Target Competencies:

Upon completion of this TAM the student will be able to:

1. Prepare and display a chronologically correct communication Timeline using dates of communication events and inventions from 15,000 B.C. to present.
2. List 5-10 selected communication events in chronological order with 100% accuracy.
3. Give examples of communication inventions the student uses in a 24 hour period.
4. Describe the impact of a communication invention or event on society.
5. Describe the impact on society if a selected communication invention had not been invented.
6. Compile a list of communication inventions or events since their "birth".
7. List ten communication systems.
8. Describe the importance of progressive technological development in communication technology.

TAM Instructions:

Introduction

This TAM is designed to give the student an appreciation and knowledge of various communication inventions, their place in history and their impact on society.

The student will construct a Timeline by matching instructor / student generated communication events and inventions with the date of their occurrence.

The Timeline activity can be expanded to include research into specific inventions and social events pertaining to communications. Emphasize how they effect our society and environment. It is important that students realize their dependance upon the communication devices and systems present in our society.

Safety Considerations

There are no special safety considerations.

Needed Materials:

Supplies Required

a. 3 X 5 cards - The number of cards depends on the number of events the instructor chooses to highlight and the method the instructor chooses to disseminate the necessary information.
b. Pencils
c. Markers
d. Transparent tape

Equipment/Machines/Tools:

a. Overhead projector
b. Scissors

Handouts

See Appendix I through VI

Instructional Resources

Jones, Ronald E. and Janet L. Robb, DISCOVERING TECHNOLOGY COMMUNICATION, (San Diego, California: Harcourt) -Brace Jovanovich, Publishers, 1986) pp. 18-32.

Jones, Ronald E. and Janet L. Robb, ACTIVITY GUIDE: DISCOVERING TECHNOLOGY COMMUNICATION, (San Diego, California: Harcourt) -Brace Jovanovich, Publishers, 1986) pp. 20.

Jones, Ronald E. and Janet L. Robb, TEACHER'S MANUAL: DISCOVERING TECHNOLOGY COMMUNICATION, (San Diego, California, Harcourt)-Brace-Jovanovich ,publishers, 1986).

Bame, Allen E. and Paul Cumings, EXPLORING TECHNOLOGY, (Worcester ,Massachusetts, Davis Publishing Inc, 1988) pp. 239-273.

Bame, Allen E. and Paul Cumings, A GUIDE FOR TEACHERS: EXPLORING TECHNOLOGY, (Worcester, Massachusetts, Davis Publishing Inc, 1988) pp. 78.

Hacker, Michael and Robert A. Barden, LIVING WITH TECHNOLOGY, (Albany, New York, Delmar Publishing Inc, 1988) pp. 141-211.

Management and Logistics Related TAMS

This is the first TAM presented to students as part of the Overview unit. The background and historical information in this TAM are the foundation upon which all remaining modules can be built.

Evaluation and Grading

The following are a few ways that you can check on the students' progress as they work through this unit:

- Students can use the Self-Check (Appendix I) to determine progress.
- A formal pretest (Appendix II) may be administered.
- In place of a pretest, the students may keep track of the number of misplaced events when a properly sequenced Timeline is presented to them.
- After proper sequence of events is given, the Timeline can be evaluated for completeness.
- Individual event cards may be evaluated by the teacher if students ask to illustrate them.
- Ask students to help determine the most important communication events (with instructor guidance). These events will be used later as part of post-test.

Suggested Schedule

This lesson is designed to provide the student with an introductory experience in communication technology and enable the student to trace developments in communication technology.

The students will be exposed to history through the use of a Timeline and supplementary activities to enhance their understanding of communication technology.

Day I

I. Introduction
    A. Read introduction (student component)
    B. Read scope (this document)
    C. Read motivational statement (Student component)

  - D. Read relationship to context (Student component)
  - E. Pass out self-check and explain its purpose (Appendix I)

II. Pre-Assessment (Appendix II)

III. Timeline Information (Appendix III)

  - A. Distribute 3 X 5 cards
  - B. Distribute Timeline strips with dates of events written on them
  - C. Chalkboard
    1. What is written on the board? (Morse Code)
    2. What does it mean? (Communication Code)
  - D. Students fill in 3 X 5 cards as the instructor uses an overhead projector to transfer information
    1. Example: Samuel Morse invented telegraph, 1744.
    2. Include other information from references if desired.
  - E. Continue process until all desired events for Timeline are discussed.(Do not give events in chronological order.)
  - F. Assignment (Appendix IV) Questionnaire

Day II

IV. Timeline construction

  - A. After rereading each card, students tape 3 X 5 cards to the time strip adjacent to the time the student believes the event occurred
  - B. When student/group is finished have students look at other students/ groups Timeline banners.
  - C. Give time for final adjustments ,if any.
  - D. Discuss questionnaires.
  - E. Assignment (Appendix V) Journal

Day III

V. Timeline corrections
  - A. Correct Timeline; read each event card again.
  - B. Students keep track of how many events they rearranged and record results on the self-check.
  - C. Student choose significant events (with instructor's guidance) for evaluation.
  - D. Review Timeline events.
  - E. Display Timelines.

Day IV

VI. Post Assessment (Appendix VI)
  - A. Post-test
  - B. Review post-test in class.
  - C. Make futuristic Timeline from the information obtained in this lesson. (Four or five events only)
  - D. Discuss futuristic Timeline.

VII. Pick up self-check list.

Optional Activities:

1. ILLUSTRATING EVENTS
   Example: sketch a phone on the telephone event card.

2. INFORMATION RETRIEVAL
   Use library to obtain information about an assigned event or a student chosen event and use the information to expand on significant or important events.

   a. Write a short paper on the event: the first telephone, then a wall- phone, dial-phone, and the touchtone phone.
   b. Sketch the development of the event.

3. List events that have occurred since the student was born.

4. Choose ten events and make individual Timelines (sketching,with no words, and using other than banner-style Timeline).

Key Instructional Suggestions:

Safety

No special safety recommendations

Motivation

In order to know where we are and where we are headed in relation to communication technology, we must know and understand where we have been.

Prerequisite information

This TAM is part of the overview; no prerequisite information is needed.

Demonstration

No technique demonstrations are done.
a. Using an overhead projector give, content information (not in chronological sequence) for students to fill out 3 X 5 cards. If desired, use instructor-generated event cards to save time.
b. The Timeline tape with dates listed may be distributed to individual students or groups of students. Students will attach event cards to the date they believe corresponds with the event. (Guide students through placing the first one or two events.)

Reinforcement

All other modules in a communication class will reinforce this TAM.

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Attitudes

Using Appendix IV and V, the students' attitude toward communication will be crystalized. Communication technology will become personalized. Through family member's events, communication history will become tangible.

Remediation/Enrichment

Nearly all students or groups finish the Timeline activity at about the same time. Some students need to be limited to certain periods of communication history so that they will not be overwhelmed.

Some students may need to do more detailed research of a particular event, create an innovative Timeline structure, and illustrate the Timeline events. They may also create a futuristic Timeline.

Summary and Review

Students are exposed to the content 3 or 4 times, depending on the activities you selected:
- a. When initial information is presented.
- b. Reading event cards when placing events in order on the Timeline.
- c. Reviewing events cards when placed in proper order.
- d. Events summarized and reviewed when events are picked as most significant.

Review Questions

Question and answers will be generated by the instructor, guided by the selection of significant events.

Glossary

Timeline - a banner displaying events by pictures or writings in chronological order.

Banner - a sign used to display communication events.

Social Impact - influence of an invention, process or system in people's lives.

Progressive Technological Development - components of a technological system are developed sequentially.

Patent - government grant to an inventor for a stated period of time giving exclusive right to make , use or sell an invention.

Inventions - new or improved process or machine.

Discover - to gain knowledge of something previously unknown.

Communication - the imparting or interchange of thought, opinions or information.

Environmental impact - negative or positive influence of an invention, process or system on its physical surroundings.

Event - an occurrence of importance.

System - combination of things or parts forming a whole.

Pre-Assessment:

Conduct a very brief pre-assessment of the students' knowledge. You may:

a. Use the enclosed pre-test prior to starting the TAM.
b. Use the student / team assembled Timeline as a pre-test.

Post-Assessment:

Conduct a post-test:

a. Use the enclosed post-test.
b. Use the events from the instructor-guided event discussion as a test.
c. Evaluate items on self-check.
d. Use the self-check sheet to record your evaluation.

Review Question Answers

a. Generate questions using the timeline events skeleton in appendix III.
b. Test keys are with the provided tests; otherwise, instructors will have to produce their own key after they determine which events they wish to emphasize.

Technology Activity Module 1

TIME TRAVEL

COMMUNICATION STYLE

by Ron Sorensen

Technology Activity Module 1

(Student Component)

Introduction:

Did you ever wonder where all of the marvelous technical things around us came from? Or who invented them, and when? This unit is designed to give you a sense of the progressive technological developments of the past. You will construct a Timeline consisting of important communication events in chronological order.

In order to determine what lies ahead in the area of communication, we must know where we are now and how we got here.

Competencies:

Upon completion of this TAM you will:

1. Produce and/or secure information about communication areas.
2. Produce an accurate Timeline.
3. Identify common communication devices you use.
4. Explain the social impact of communication inventions.
5. Identify many communication inventions.
6. Explain the importance of progressive technological development in communications.

Module Overview:

Motivational statement

Which came first -- paper or the alphabet? Which came first -- the telephone or the wire? In this unit we will investigate which of the previous items came first and how these events lead to the communication marvels of today.

Relationship to Context

a. This module gives you an overview of the many areas of communication and their historical sequence. Some of the areas and events you probably never realized were a part of communications.
b. This module will be the first in a series of building blocks in a fascinating study of communication events, devices, and procedures.

Key Instructional Suggestions:

Class Presentations

1. Communication events given out of sequence
2. Pre-historic events
3. Renaissance events.
4. Industrial Revolution events
5. Twentieth Century events
6. Space Age events

Demonstrations

Communication Timeline Construction

Safety

No special safety considerations

Personal Activity

1. Assemble Timeline without instructor guidance.
2. Make corrections to Timeline, if necessary, with instructor guidance.
3. Research specific communication events (emphasize social impact).
4. Keep a 24-hour journal to determine communication devices you actually use.
5. Complete the questionnaire to determine effects of communication devices on your family.
6. Construct a futuristic Timeline using your imagination; look into the future to determine available communication devices.

Other

1. List the communication devices invented in your lifetime.

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2. Choose 10 events to construct your own Timeline using sketches no words. Display a Timeline in other than banner style.
3. Describe what the world would be like if a particularcommunication device was not invented.
4. Illustrate event cards.

Needed Materials:

Supplies

1. 3 X 5 cards
2. Pencil or markers
3. Transparent tape

Equipment/Machines/Tools

N/A

Handouts/Instructional Resources

1. Dated time strip
2. Self-check sheet
3. Questionnaire
4. Journal sheet

Activity Sequence

1. Instructor start-up and specific instructions (Introduction)
2. Pre-test
3. Plan of procedure
    - Communication event cards (notify instructor if you do not have all necessary information on an individual event card before the instructor proceeds to the next event)
    - Instructor will pass out time strips with dates on them.
    - Tape 3 X 5 cards to the strip with transparent tape in what you believe is the proper sequence. Read event cards carefully to determine their location. (notify instructor when completed)
    - Questionnaire. Take the questionnaire home and ask your parents and grandparents the questions listed on the questionnaire.
    - Journal. Take the journal with you today and write down each time you use a type of communication. Examples are listed on the journal.
    - Review Timeline and select what you believe to be the most significant device or event. When asked, tell the instructor of your decision. These events will be used in the evaluation.
4. Post-assessment

Summary and Wrap-up

1. Review post-assessment.
2. Construct a futuristic Timeline for the next 10 years based on the information we have just studied. Discuss how they determine what will be in the future. (progressive technology development).

APPENDIX I

STUDENT SELF-CHECK

	Check here when completed	Score
Pre-test	____________	____
3 X 5 event cards completed	____________	____
Questionnaire assignment	____________	____
Assembled Timeline (student generated)	____________	____
Corrected Timeline	____________	____
Timeline displayed	____________	____
24 hour journal	____________	____
Post-test	____________	____
Futuristic Timeline	____________	____
Additional Activities:		
• List of inventions in student's lifetime	____________	____
• Illustrated Timeline	____________	____
• Information retrieval	____________	____
• Collage	____________	____
		Total____

APPENDIX II

PRETEST

Please place a check beside the communication inventions that you believe to be invented in the United States.

1. _____ Telegraph
2. _____ Telephone
3. _____ Movable type
4. _____ Tape recorder
5. _____ Wireless telegraph

Place the letter of the communication invention next to the corresponding date.

6. _____ 1826
7. _____ 1844
8. _____ 1868
9. _____ 1876
10. _____ 1877
11. _____ 1888
12. _____ 1942
13. _____ 1960
14. _____ 1962
15. _____ 1986

A. Morse code
B. Phonograph
C. Permanent photography
D. Television
E. Telephone
F. Typewriter
G. Motion picture camera
H. First communication satellite
I. First laser
J. Filmless photography

APPENDIX II

PRETEST

KEY

Please place a check beside the communication inventions that you believe to be invented in the United States.

1. __X__ Telegraph
2. __X__ Telephone
3. ______ Movable type
4. ______ Tape recorder
5. ______ Wireless telegraph

Place the letter of the communication invention next to the corresponding date.

6. ___C___ 1826
7. ___A___ 1844
8. ___F___ 1868
9. ___E___ 1876
10. ___B___ 1877
11. ___G___ 1888
12. ___D___ 1942
13. ___I___ 1960
14. ___H___ 1962
15. ___J___ 1986

A. Morse code
B. Phonograph
C. Permanent photography
D. Television
E. Telephone
F. Typewriter
G. Motion picture camera
H. First communication satellite
I. First laser
J. Filmless photography

APPENDIX III

TAM #1: Time Travel: Communication Style
Missouri Introduction to Communication Technology Guide, 1990

SKELETON TIMELINE

The instructor may use all or part of this Timeline. Detailed information concerning individual events of this Timeline is given in the references.

15,000 B.C. Paintings on cave walls

4,000 B.C. Cuniform writing

3,000 B.C. Hieroglyphics (Egypt)

2,500 B.C. Earliest form of paper (papyrus plant) Egypt

100 A.D. Papermaking perfected (Chinese)

868 Printing with wood blocks (Chinese)

1100 Printing with movable type (Chinese)

1456 Johannes Gutenberg prints Bible

1474 First book printed in English

1492 America discovered

1519 Obscura camera developed in Italy

1622 First English newspaper

1639 First press in America

1784 First daily newspaper in America

1792 Principle of lithography

1826 First permanent photograph

1833 Analytical engine

1844 First telegraph message

1858 First transatlantic telegraph cable (lasted 2 weeks)

1859 Web press

1860 Pony Express

1865 Wood pulp paper perfected

1866 First successful transatlantic cable

1868 First mechanical typewriter

1875 First radio

1876 Telephone

1877 Phonograph

1883 First women's magazine

1886 Halftone process developed

1888 George Eastman develops Kodak camera; Kinetograph invented

1891 Motion picture camera patented

1892 Color photography

1896 Wireless telegraph

1898 First tape recorder

1902 First motion picture theater in L.A.

1904 Offset press constructed

1906 Adion tube

1913 Parcelpost begins

1918 First airmail route; Electron discovered

1923 Transatlantic shortwave radio; Transmitting and receiving system for T.V.

1927 Scanning system for T.V.

1938 Xerographic copy

1946 First use of digital computer

1948 Transistor invented; First transistor radio (Sony)

1955 Optical fibers made

1956 Transatlantic telephone cable

1957 Sputnik

1960 Laser, holograms

1962 Telstar

1967 56 million homes with a T.V.

1970 Low cost fiber optic cable

1975 Silverless photo film

1976 Apple computers born in a garage

1978 Laser video disk

1982 Liquid crystal display

1986 Filmless photography

Time Strip Appendix III

Cut along the lines provided and attach strips end to end.

4,000 B.C.	2,500 B.C.	868	1456
15,000 B.C.	3,000 B.C.	100 A.D.	1100
1492	1622	1784	1826
1474	1519	1639	1792
1844	1859	1865	1868
1833	1858	1860	1866
1876	1883	1888	1892
1875	1877	1886	1891
1898	1904	1913	1923
1896	1902	1906	1918
1938	1948	1956	1960
1927	1946	1955	1957
1967	1975	1978	1986
1962	1970	1976	1982

APPENDIX IV

ASSIGNMENT I

QUESTIONNAIRE

Student section - Answer the following questions:
1. How many T.V.s do you have in your home?
2. How many hours each week do you watch T.V.?
3. How old were you when you got your first T.V.?
4. Do you have a computer at home?

Grandparent section -
1. How old were you when you first watched T.V.?
2. How old were you when you first had a T.V. in your home?
3. What was your favorite T.V. program when you first got a T.V.?
4. Do you remember any commercials from your favorite show?
5. What was your favorite radio program ?
6. What did you do when you were my age if you did not have a T.V.?

Parents section -
1. How old were you when you first saw T.V.?
2. How old were you when a T.V. was first in your home?
3. What was your favorite T.V. show when you first watched T.V.?
4. Do you remember any commercials from your favorite T.V. program?

Compare the answers to the above questions. Do you notice any advancement in visual communications in the last two generations?

APPENDIX V

ASSIGNMENT II

During the next 24 hours, list the communications you use. Also, please list the time the communication invention was used and the type of message you received.

EXAMPLES

TIME	INVENTION	MESSAGE
Now	paper and ink	assignment
Night	T.V.	news/entertainment
Morning	phone	friend talking

APPENDIX VI

POST-TEST

Place a check mark beside the item(s) listed below which you believe were invented in America. (1 pt. ea)

1. _____ Transistor radio (pocket sized)
2. _____ Movable type
3. _____ Television
4. _____ Telephone
5. _____ Tape recorder

Matching (1pt. ea)
On the line provided,write the letter of the invention that corresponds to the date you believe the invention was invented.

6. _____ 1456
7. _____ 1826
8. _____ 1868
9. _____ 1875
10. _____ 1877
11. _____ 1891
12. _____ 1938
13. _____ 1948
14. _____ 1957
15. _____ 1962

A. Phonograph
B. Laser
C. Movable type
D. Transistor radio
E. Communication satellite
F. Xerographic copy
G. Permanent photograph
H. Typewriter
I. First radio
J. Motion picture camera

POST-TEST

Write the answers to the following questions in the space provided.

16. (10 pts.) Define progressive technological development.

17. (5 pts.) List ten devices or areas of communication.

18. (1 pt.) Which came first -- paper or the alphabet?

19. (1 pt.) Name the man that failed with the telegraph but succeeded with another communication device that was to help his grandfather hear better.

20. (1 pt.) If Alexander Graham Bell would have been three hours later to the patent office, who would have been known as the inventor of the telephone?

APPENDIX VI

POST-TEST

KEY

Place a check mark beside the item(s) listed below you believe were invented in America. (1 pt. ea)

1. _____ Transistor radio (pocket sized)

2. _____ Movable type

3. __X_ Television

4. __X_ Telephone

5. _____ Tape Recorder

Matching (1pt. ea)
On the line provided write the letter of the invention that corresponds to the date you believe the invention was invented.

6. __C__ 1456

7. __G__ 1826

8. __H__ 1868

9. __I__ 1875

10. __A__ 1877

11. __J__ 1891

12. __F__ 1938

13. __D__ 1948

14. __B__ 1957

15. __E__ 1962

A. Phonograph

B. Laser

C. Movable type

D. Transistor Radio

E. Communication satellite

F. Xerographic copy

G. Permanent photograph

H. Typewriter

I. First radio

J. Motion Picture camera

POST-TEST **KEY**

Write the answers to the following questions in the space provided.

16. (10 pts.) Define progressive technological development.

NEW TECHNOLOGY BUILDS AND EXPANDS ON PAST TECHNOLOGICAL ACHIEVEMENTS. THE RAW MATERIALS TO PRODUCE THE COMPUTER WERE PRESENT HUNDREDS OF YEARS AGO, BUT THE SUPPORTING TECHNOLOGY TO PROCESS THE MATERIALS WAS NOT AVAILABLE.

17. (5 pts.) List ten devices or areas of communication.

TELEVISION, RADIO, NEWSPAPER, FIBER OPTICS, ROAD SIGNS, COMPUTERS, TELEPHONE, MAGAZINES, HAND SIGNALS, TELEGRAPH AND BODY LANGUAGE

18. (1 pt.) Which came first -- paper or the alphabet?

ALPHABET

19. (1 pt.) Name the man that failed with the telegraph but succeeded with another communication device that was to help his grandfather hear better.

ALEXANDER GRAHAM BELL AND THE TELEPHONE

20. (1 pt.) If Alexander Graham Bell would have been three hours later to the patent office, who would have been known as the inventor of the telephone?

ELISHA GRAY

Technology Activity Module 2

USING ASCII

FOR COMPUTER TELECOMMUNICATIONS

by Dick Kahoe

Instructor Component

Activity Objective:

The objective for this activity is to explain to the student what the ASCII code is, and how it is used to handle characters and control codes in a computer, and why ASCII is necessary for information transfer between different types of computers. This TAM shows how standard computer code is used for the numbers, letters, and punctuation marks that comprise text for all micro-computers.

Target Competencies:

By completing this TAM, the student will be able to:

1. Explain in writing the need for a code for computer information.
2. Using paper and pencil or the computer, encode or decode English text to ASCII.
3. Compare and contrast computer programs and computer data.

TAM Instructions:

Introduction

The computer cannot read, process, or understand the English language as you and I know it. Nouns, verbs, conjunctions, punctuation, sentences, and paragraphs are all beyond the computers' processing capability. A computer processes only numbers. For the computer to handle text, every character or symbol has to be coded as a number. American Standard

Code for Information Interchange (ASCII) is one of the most widely used codes. The instructor can compare this coding to the way people transfer information using a common language like English, French, or Spanish. Without a code like ASCII, trying to transfer information between two different brands of computers would be like using Spanish to tell an English speaker how to change a tire. Because of the wide variety of computers and software available to the instructor, this TAM contains several different activities labeled according to their respective requirements. In this TAM students can encode their names in ASCII, prepare a file to be transferred between two different types of computers, and operate computer tutorial programs that illustrate or explain the ASCII code.

Safety Considerations

Careful attention should be given to common safety precautions for electrical devices. Beverages or other liquids should not be allowed to spill on the computer or keyboard. The voltages used in communication ports are low (+/- 12 volts) and pose little hazard to the operator. To prevent damage to the equipment, the computer and any peripherals should be switched off before connecting or disconnecting any cables. Students should be instructed in the basic operation of the computer and the safe handling of computer discs. Computer discs need to be handled by the jackets, avoiding liquids and magnetic fields.

Needed Materials:

Equipment

(Not all materials are required for all activities. The instructor should use this list to determine which activities can be paired with the available equipment.)

Computer:
Apple II, IBM PC or compatible, Radio Shack TRS-80 Models I, III, IV, 100, 200, 600, Apple Macintosh, Amiga, or other micro-computer.

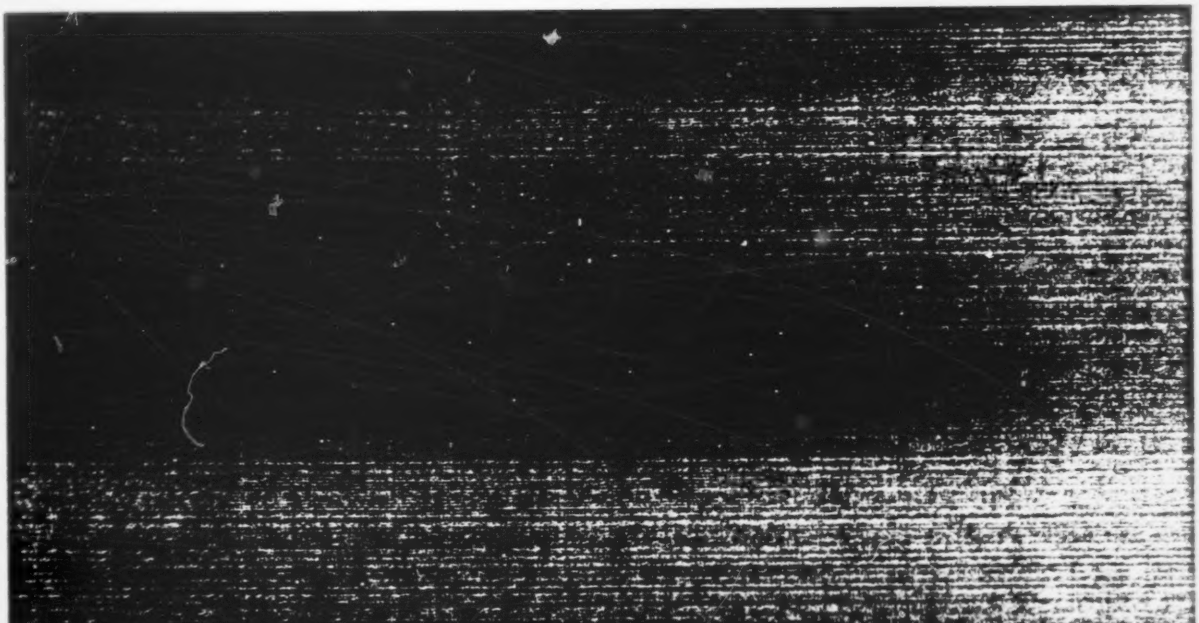
Software:
Operating System software for computer.

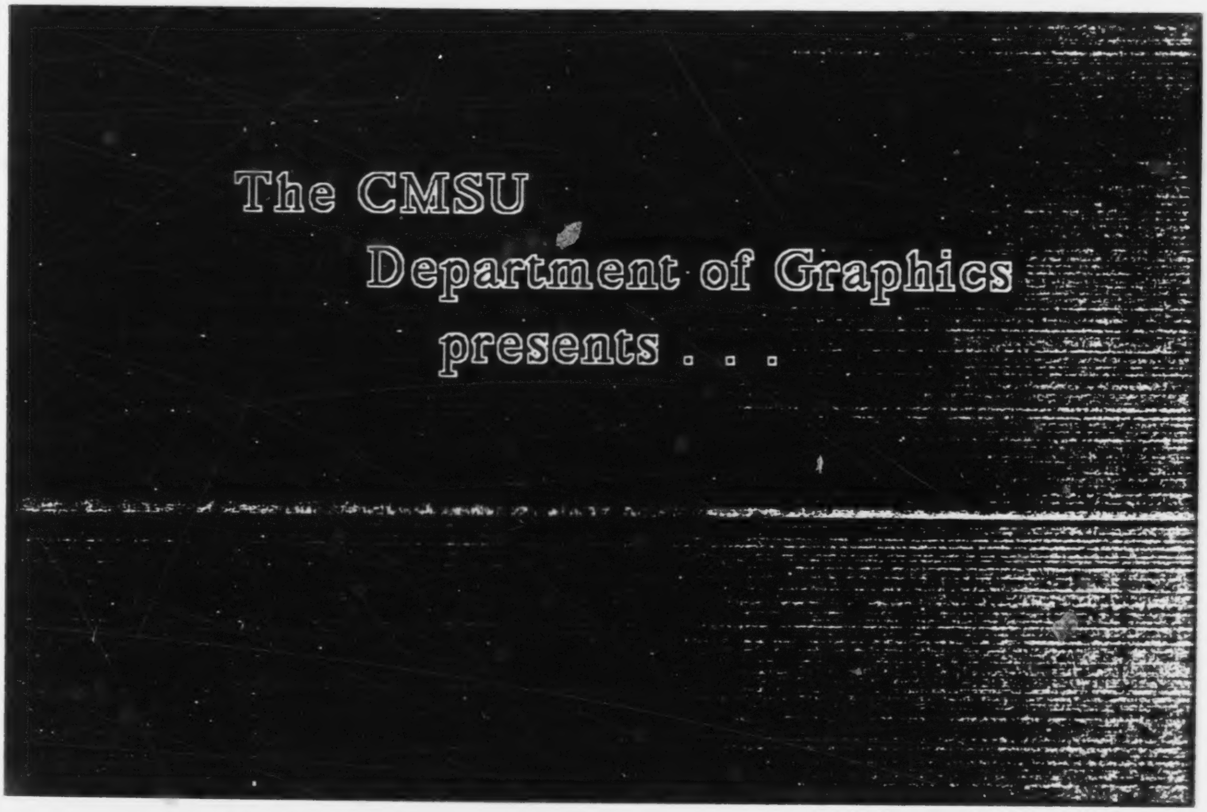
BASIC
This TAM an Apple Macintosh disc that contains a **Tutorial on ASCII.** To use the tutorial you must first load a program called Hypercard on a Macintosh computer. The tutorial presents information and requests input from the student through the keyboard and the mouse.**The following pages outline the segments of the program for you.**

Cables with computer compatible ends.

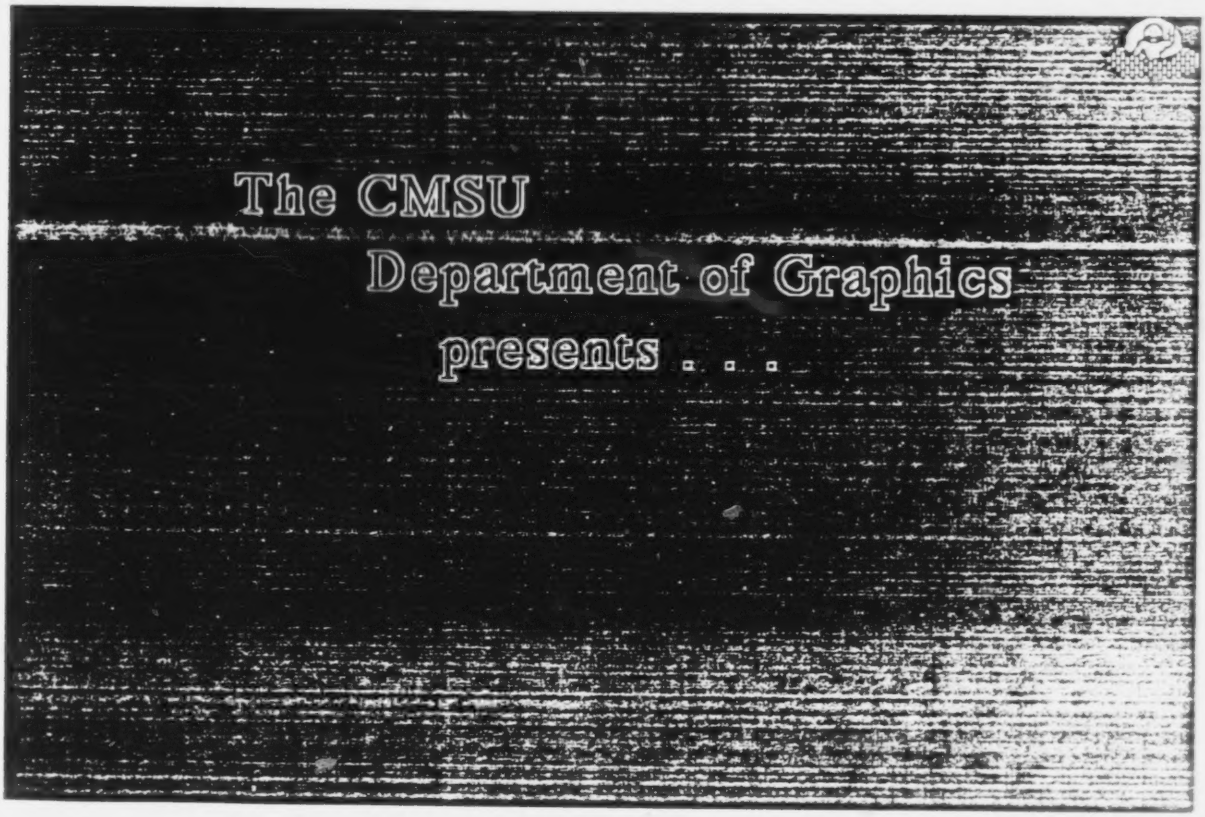
Handouts

Student component of TAM





The CMSU
Department of Graphics
presents . . .

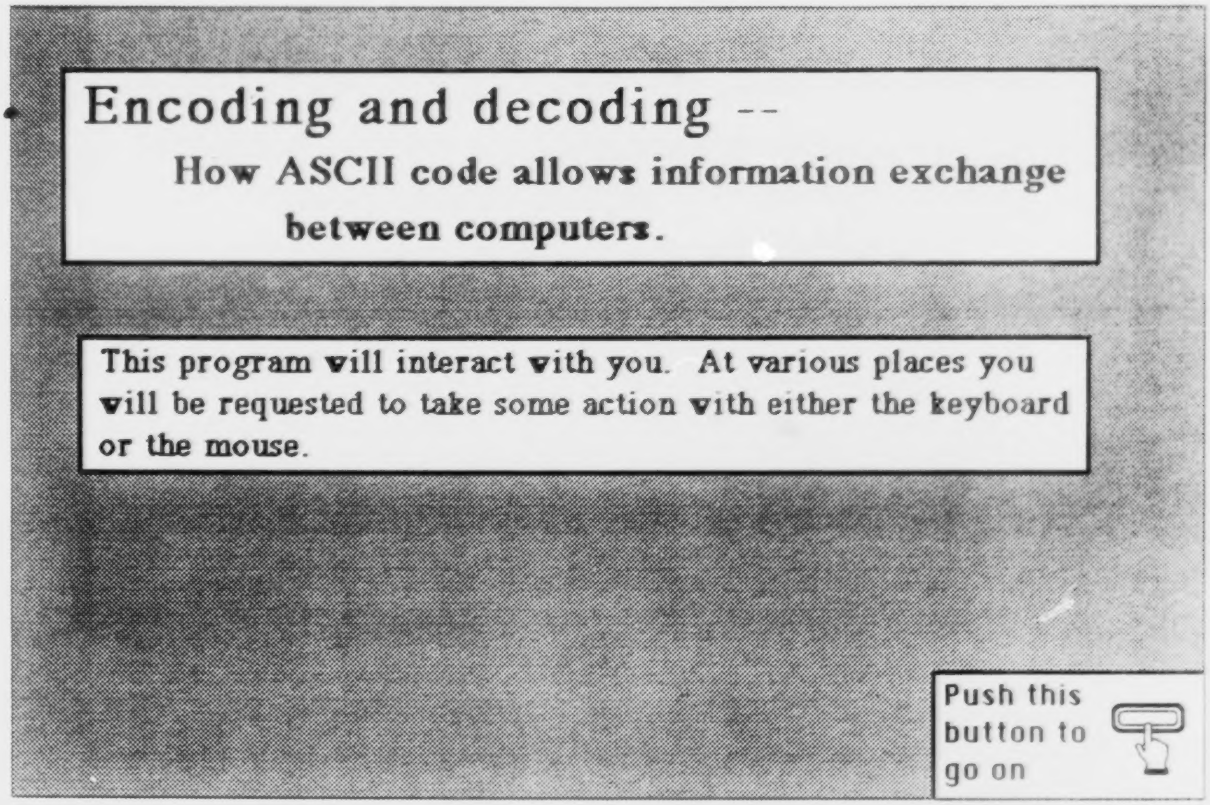


The CMSU
Department of Graphics
presents . . .

Encoding and decoding --

Encoding and decoding --

How ASCII code allows information exchange between computers.

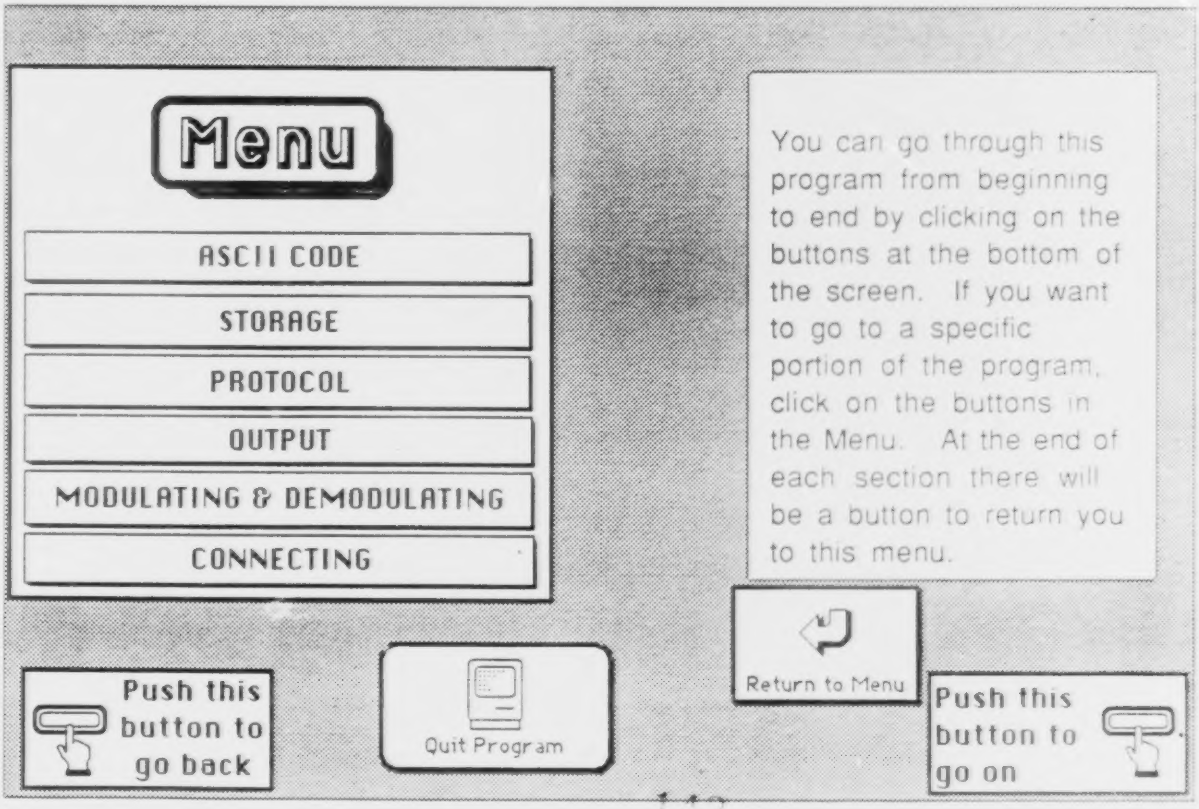


Encoding and decoding --

How ASCII code allows information exchange between computers.

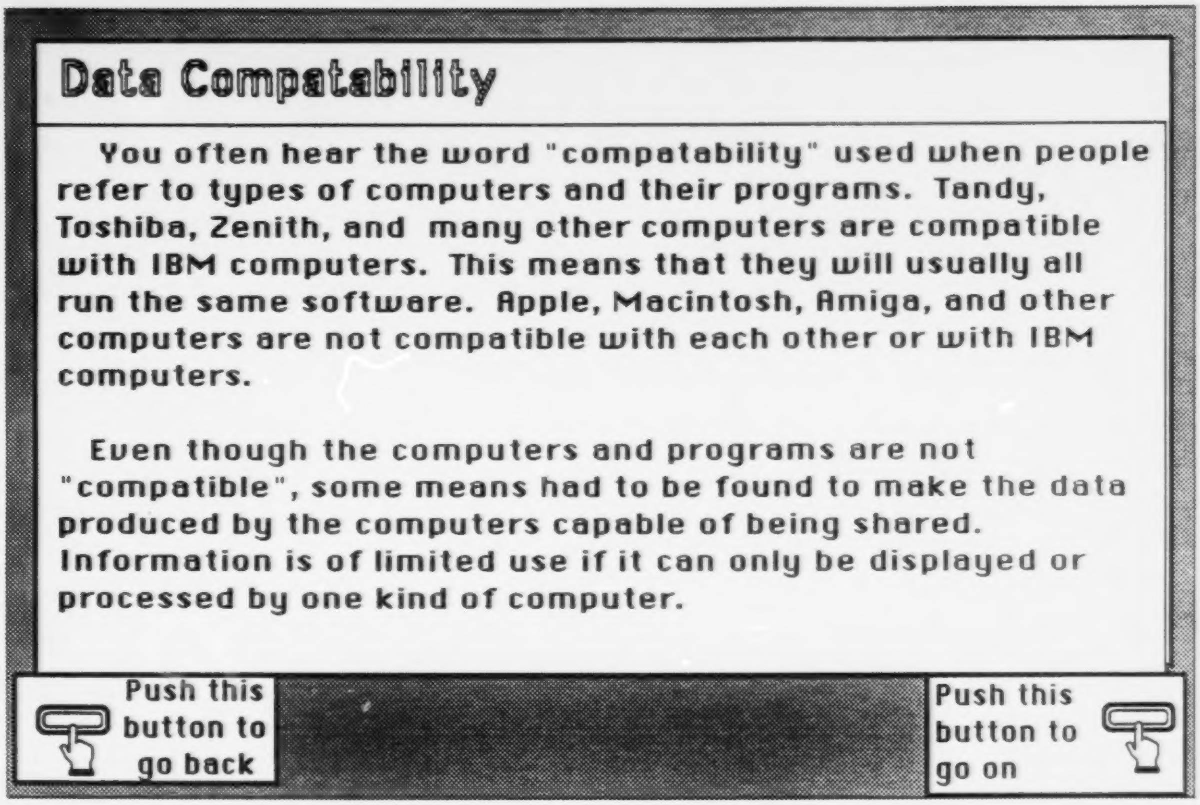
This program will interact with you. At various places you will be requested to take some action with either the keyboard or the mouse.

Push this button to go on



You can go through this program from beginning to end by clicking on the buttons at the bottom of the screen. If you want to go to a specific portion of the program, click on the buttons in the Menu. At the end of each section there will be a button to return you to this menu.

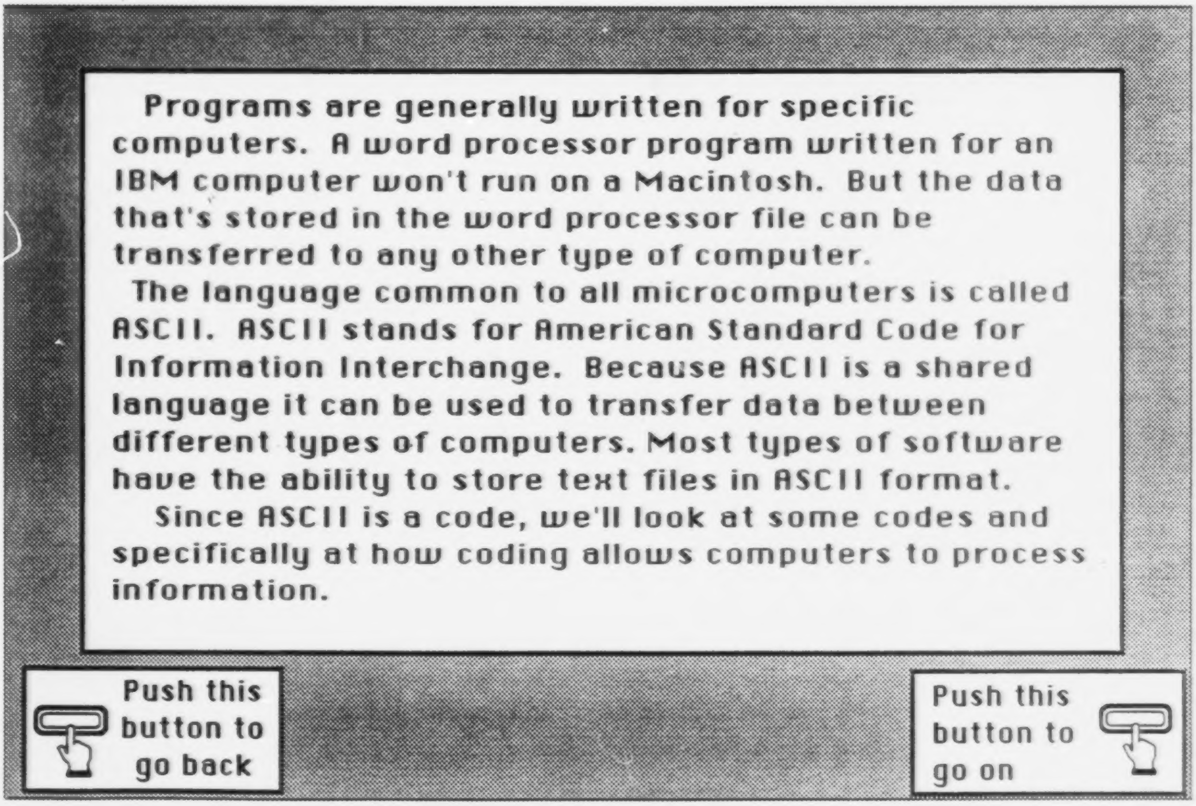
Menu
ASCII CODE
STORAGE
PROTOCOL
OUTPUT
MODULATING & DEMODULATING
CONNECTING
Push this button to go back
Quit Program
Return to Menu
Push this button to go on



Data Compatability

You often hear the word "compatability" used when people refer to types of computers and their programs. Tandy, Toshiba, Zenith, and many other computers are compatible with IBM computers. This means that they will usually all run the same software. Apple, Macintosh, Amiga, and other computers are not compatible with each other or with IBM computers.

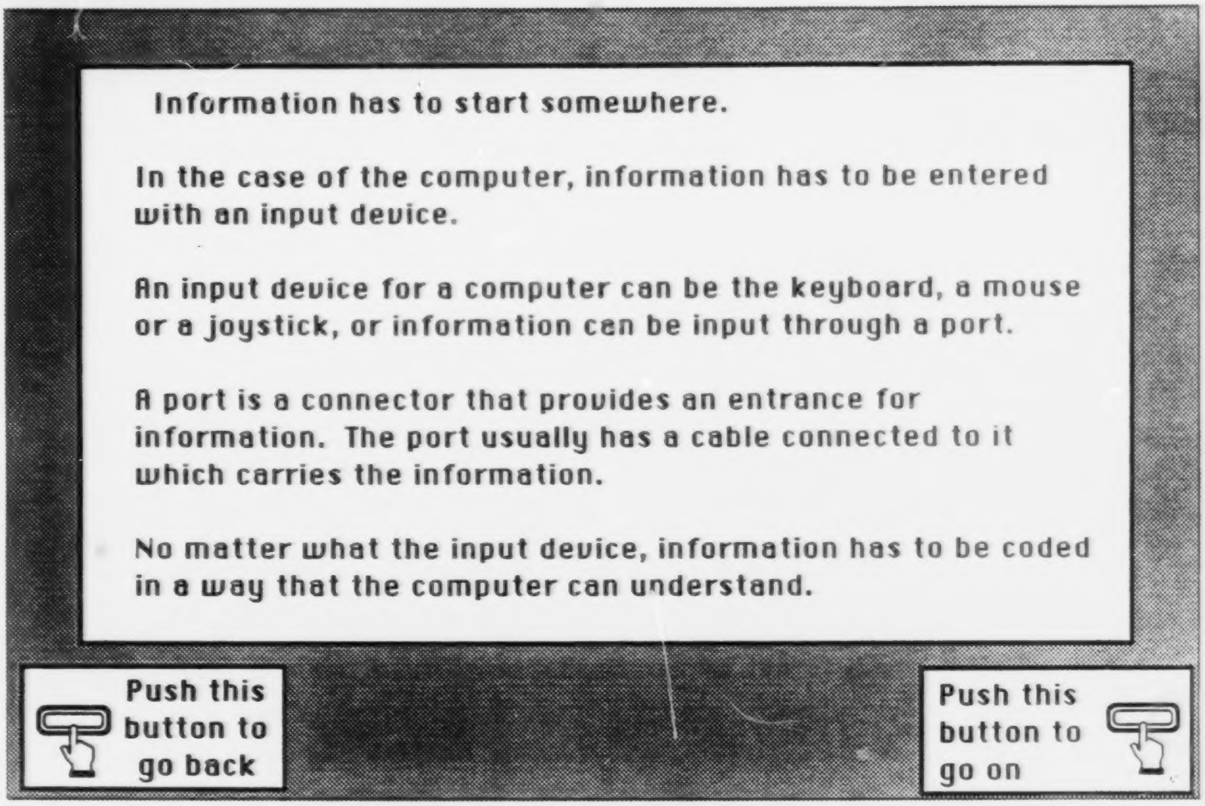
Even though the computers and programs are not "compatible", some means had to be found to make the data produced by the computers capable of being shared. Information is of limited use if it can only be displayed or processed by one kind of computer.



Programs are generally written for specific computers. A word processor program written for an IBM computer won't run on a Macintosh. But the data that's stored in the word processor file can be transferred to any other type of computer.

The language common to all microcomputers is called ASCII. ASCII stands for American Standard Code for Information Interchange. Because ASCII is a shared language it can be used to transfer data between different types of computers. Most types of software have the ability to store text files in ASCII format.

Since ASCII is a code, we'll look at some codes and specifically at how coding allows computers to process information.



Information has to start somewhere.

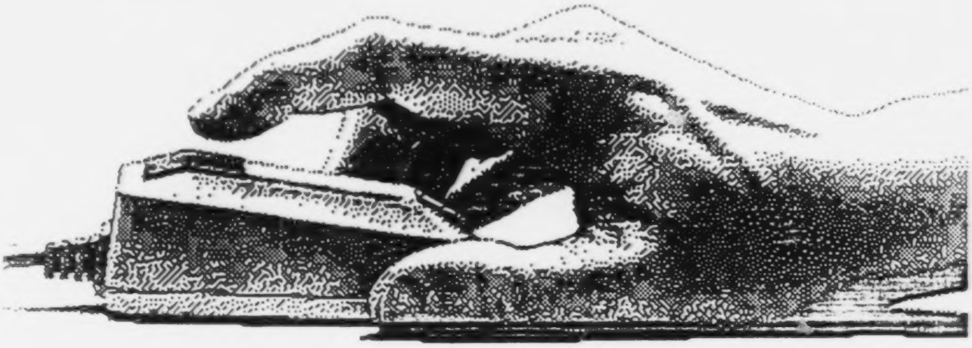
In the case of the computer, information has to be entered with an input device.

An input device for a computer can be the keyboard, a mouse or a joystick, or information can be input through a port.

A port is a connector that provides an entrance for information. The port usually has a cable connected to it which carries the information.

No matter what the input device, information has to be coded in a way that the computer can understand.

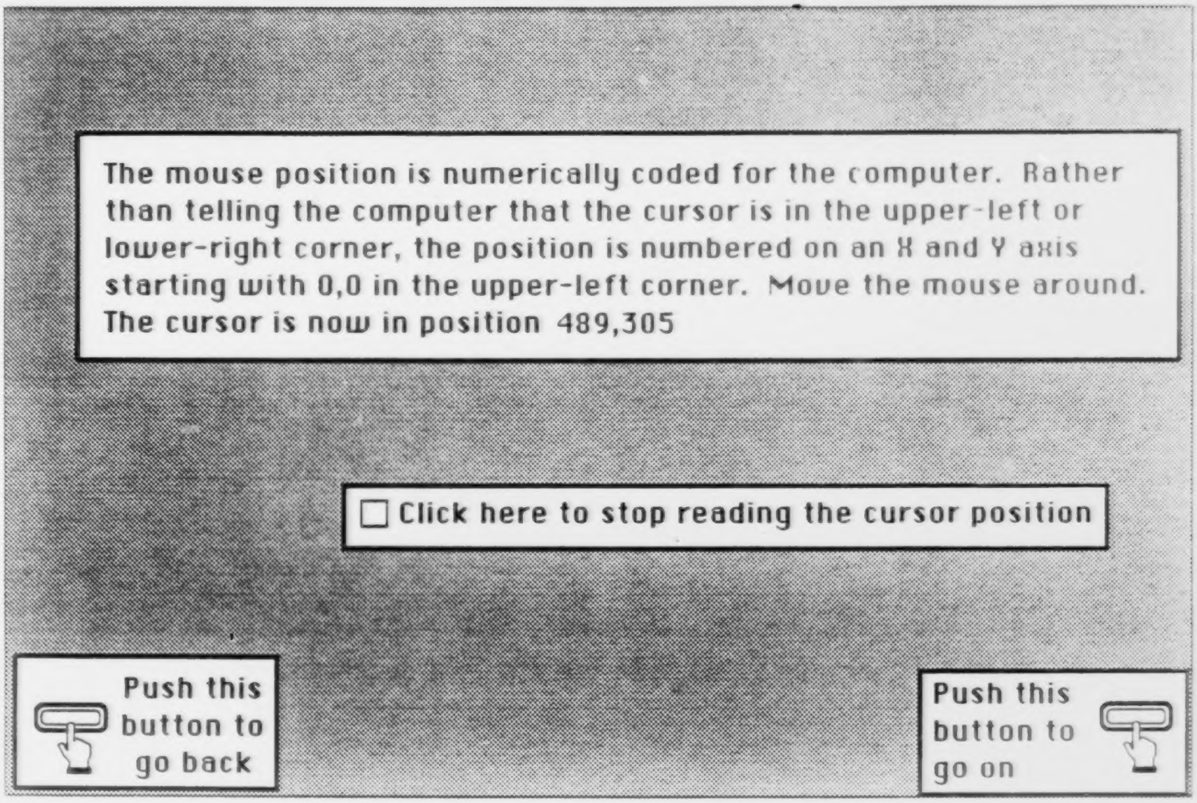
The mouse is an input device.
The mechanical energy from your hand is converted to electrical impulses that convey information to the computer.



Move your mouse around the screen.

Push this button to go back

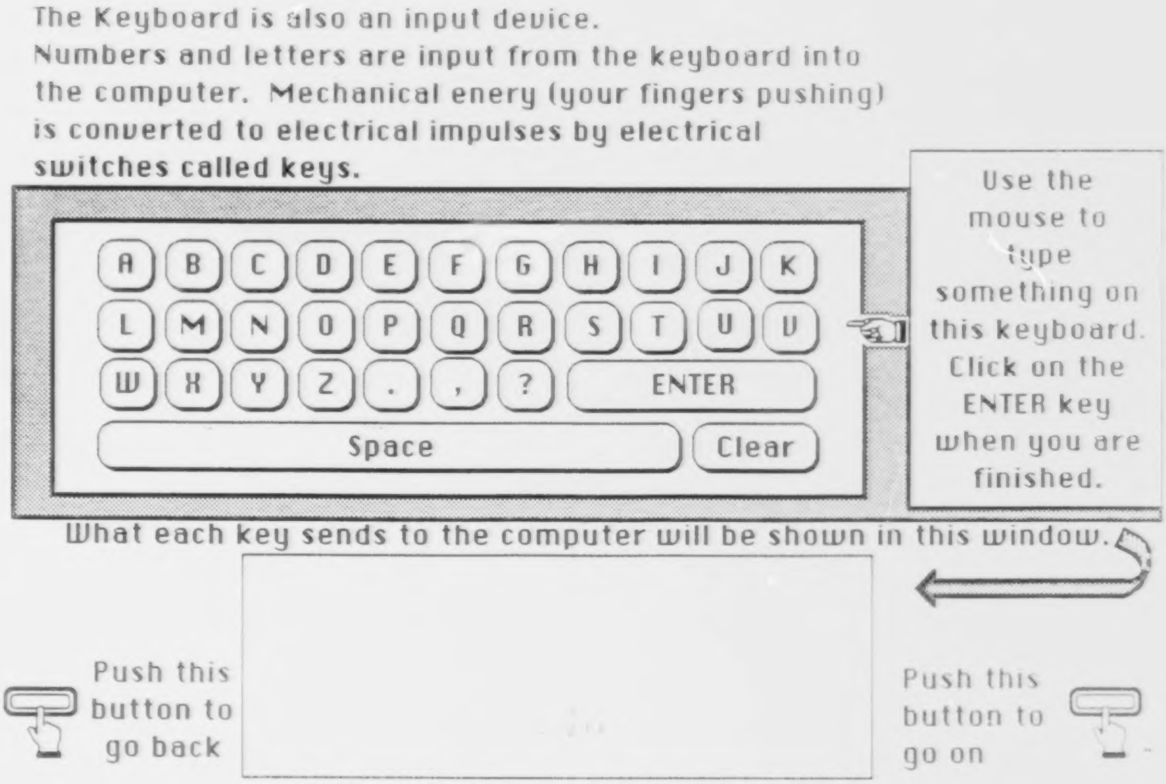
Push this button to go on



The mouse position is numerically coded for the computer. Rather than telling the computer that the cursor is in the upper-left or lower-right corner, the position is numbered on an X and Y axis starting with 0,0 in the upper-left corner. Move the mouse around. The cursor is now in position 489,305

☐ Click here to stop reading the cursor position

Push this button to go back
Push this button to go on

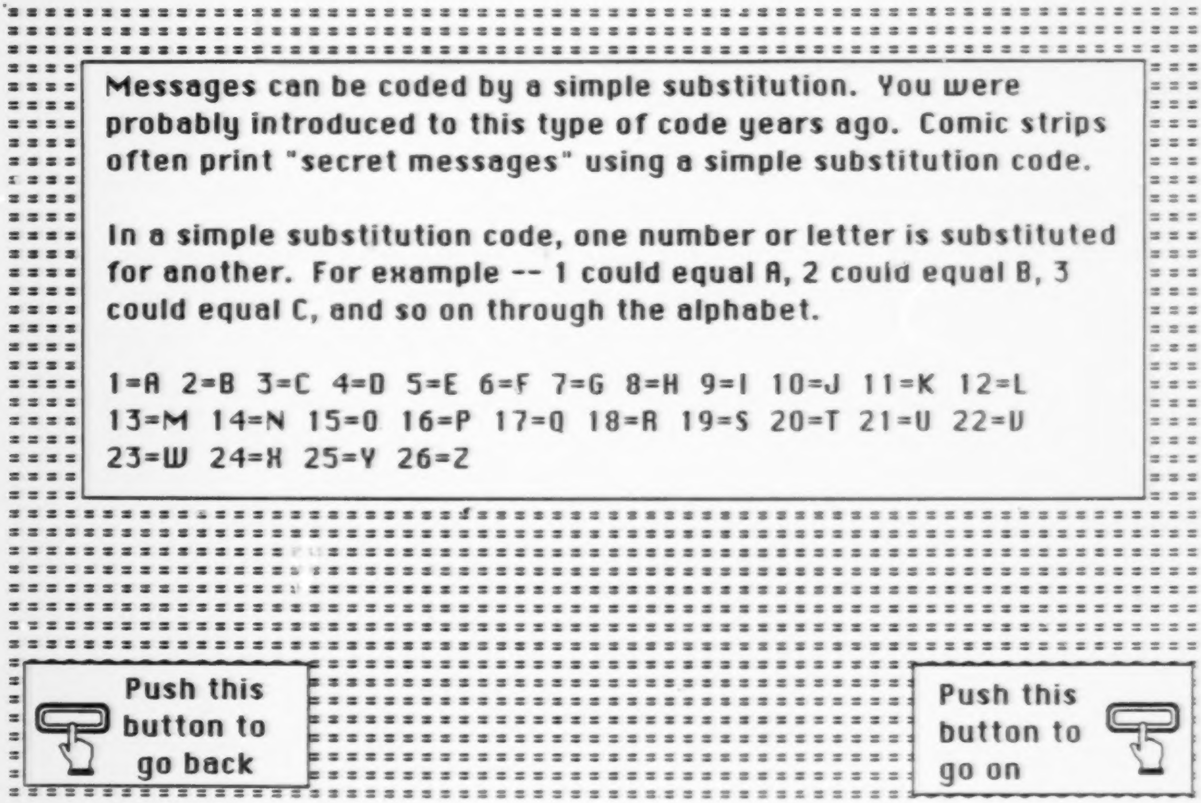


The Keyboard is also an input device. Numbers and letters are input from the keyboard into the computer. Mechanical enery (your fingers pushing) is converted to electrical impulses by electrical switches called keys.

Use the mouse to type something on this keyboard. Click on the ENTER key when you are finished.

What each key sends to the computer will be shown in this window.

A B C D E F G H I J K
L M N O P Q R S T U V
W X Y Z . , ? ENTER
Space Clear
Push this button to go back
Push this button to go on

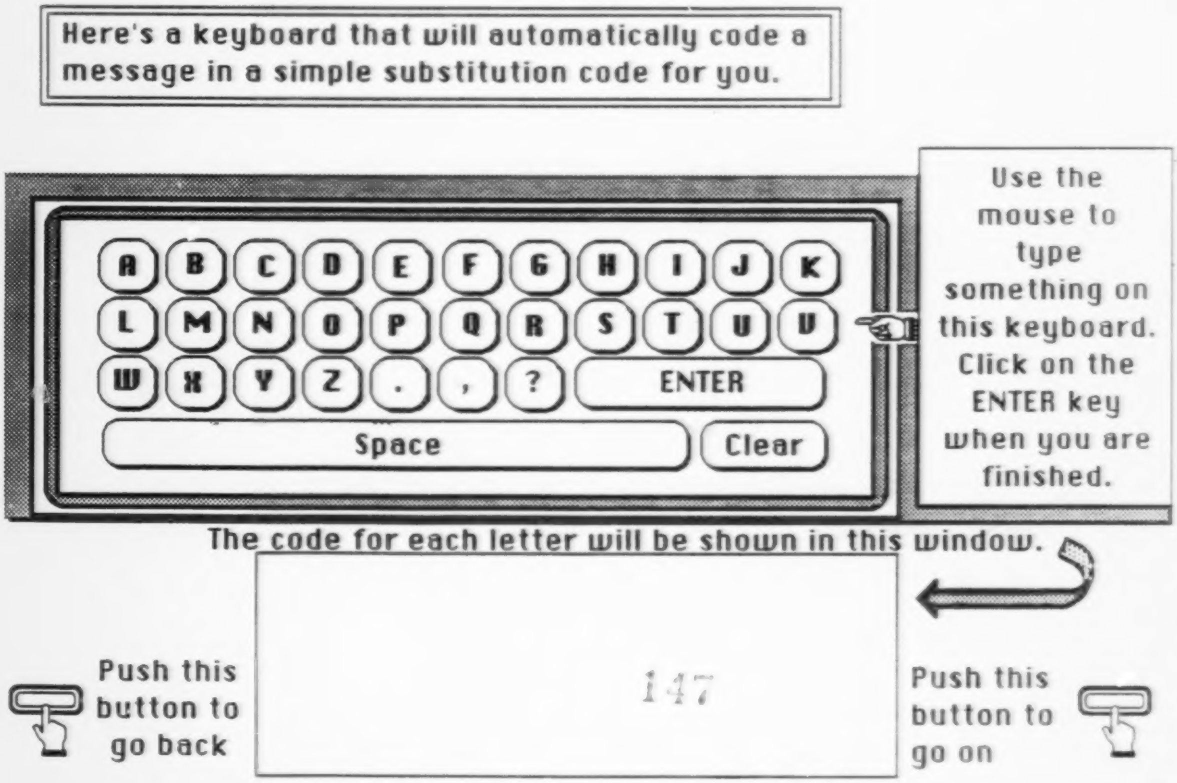


Messages can be coded by a simple substitution. You were probably introduced to this type of code years ago. Comic strips often print "secret messages" using a simple substitution code.

In a simple substitution code, one number or letter is substituted for another. For example -- 1 could equal A, 2 could equal B, 3 could equal C, and so on through the alphabet.

1=A 2=B 3=C 4=D 5=E 6=F 7=G 8=H 9=I 10=J 11=K 12=L
13=M 14=N 15=O 16=P 17=Q 18=R 19=S 20=T 21=U 22=V
23=W 24=X 25=Y 26=Z

Push this button to go back
Push this button to go on

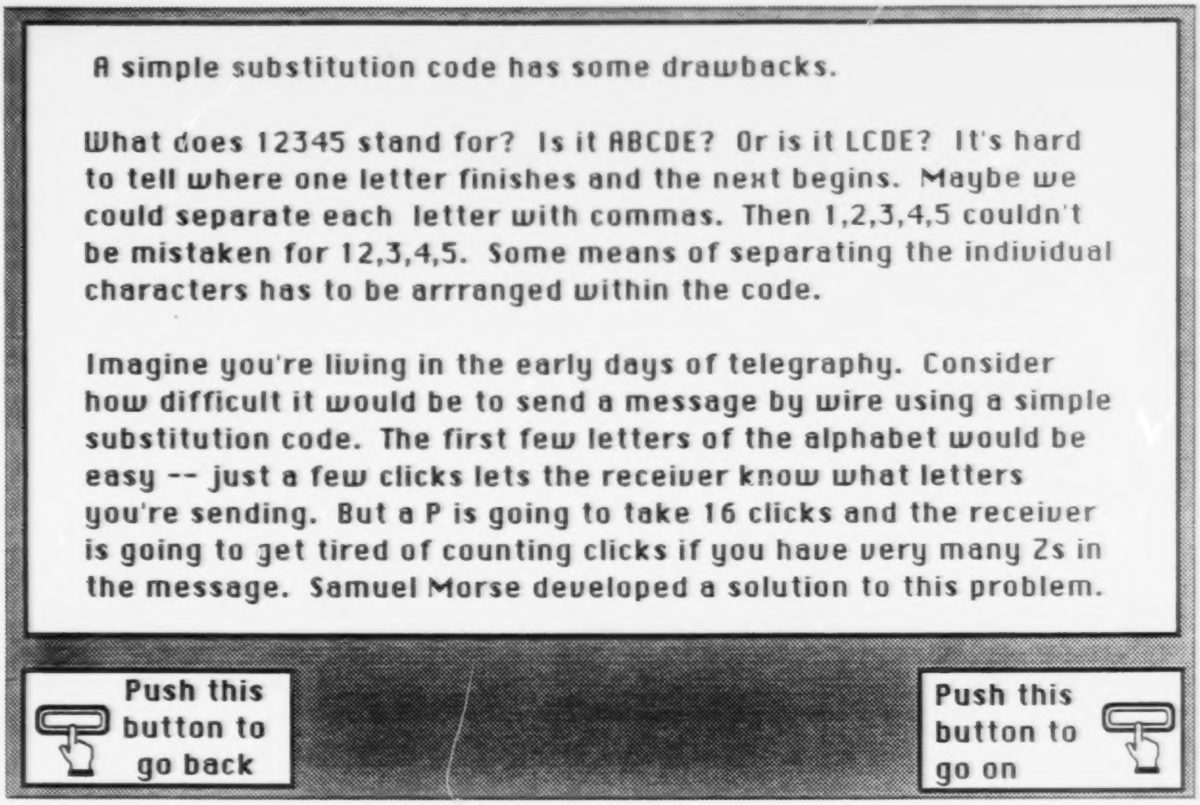


Here's a keyboard that will automatically code a message in a simple substitution code for you.

Use the mouse to type something on this keyboard. Click on the ENTER key when you are finished.

The code for each letter will be shown in this window.

A B C D E F G H I J K
L M N O P Q R S T U V
W X Y Z . , ? ENTER
Space Clear
Push this button to go back
Push this button to go on

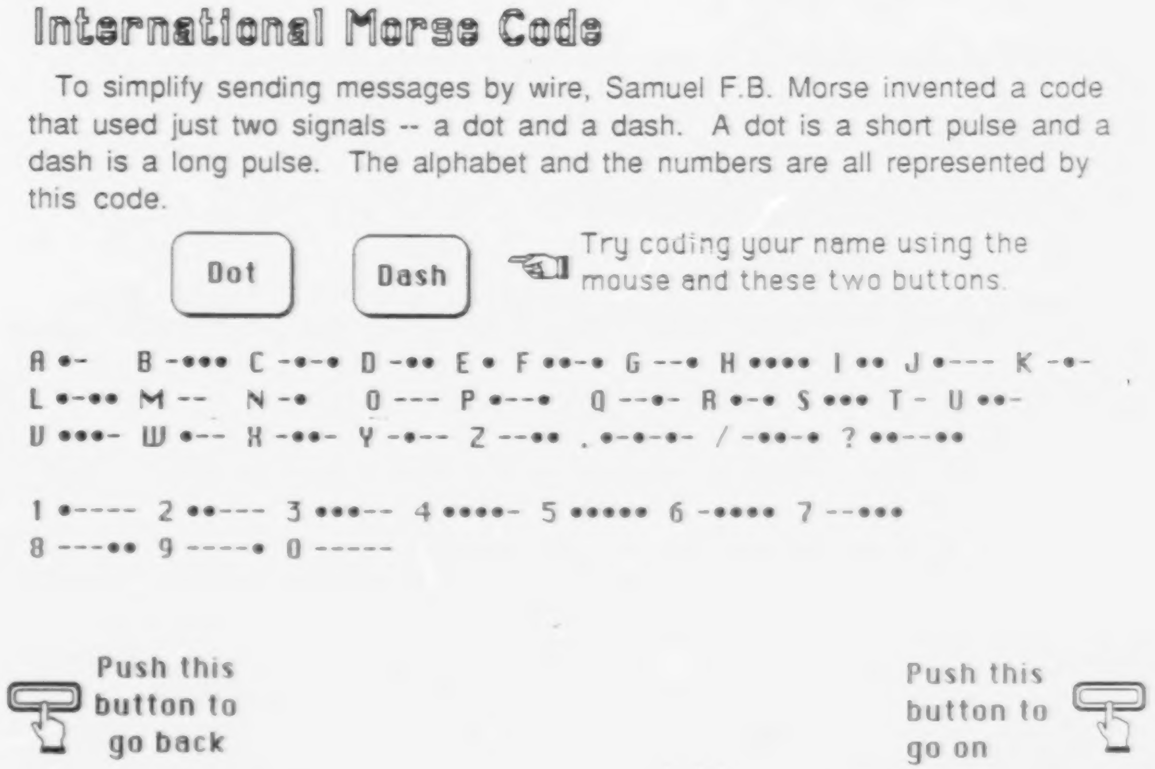


A simple substitution code has some drawbacks.

What does 12345 stand for? Is it ABCDE? Or is it LCDE? It's hard to tell where one letter finishes and the next begins. Maybe we could separate each letter with commas. Then 1,2,3,4,5 couldn't be mistaken for 12,3,4,5. Some means of separating the individual characters has to be arrranged within the code.

Imagine you're living in the early days of telegraphy. Consider how difficult it would be to send a message by wire using a simple substitution code. The first few letters of the alphabet would be easy -- just a few clicks lets the receiver know what letters you're sending. But a P is going to take 16 clicks and the receiver is going to get tired of counting clicks if you have very many Zs in the message. Samuel Morse developed a solution to this problem.

Push this button to go back
Push this button to go on



International Morse Code

To simplify sending messages by wire, Samuel F.B. Morse invented a code that used just two signals -- a dot and a dash. A dot is a short pulse and a dash is a long pulse. The alphabet and the numbers are all represented by this code.

Try coding your name using the mouse and these two buttons.

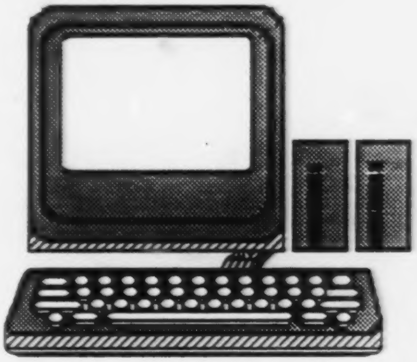
A •- B -••• C -•-• D -•• E • F ••-• G --• H •••• I •• J •--- K -•-
L •-•• M -- N -• O --- P •--• Q --•- R •-• S ••• T - U ••-
V •••- W •-- X -••- Y -•-- Z --•• . •-•-•- / -••-• ? ••--••

1 •---- 2 ••--- 3 •••-- 4 ••••- 5 ••••• 6 -•••• 7 --•••
8 ---•• 9 ----• 0 -----

Push this button to go back
Push this button to go on

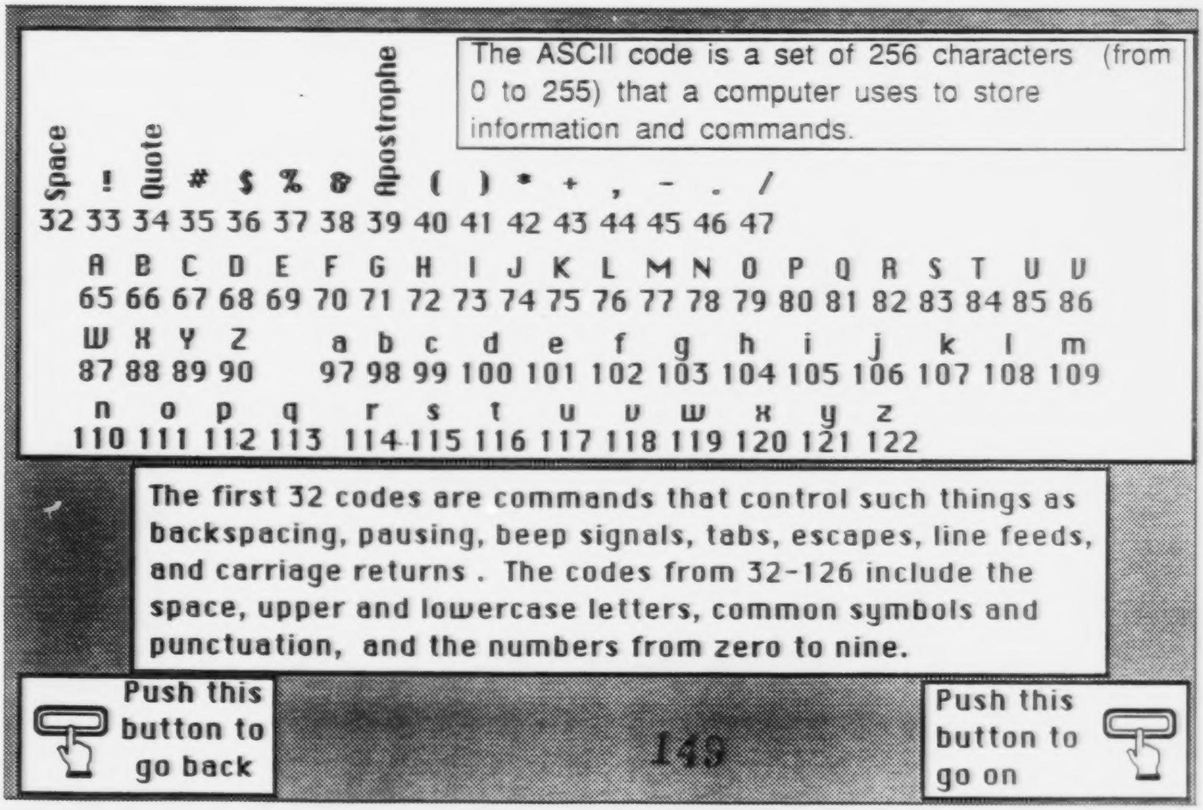
Information can't just be transferred from one computer to another. The information has to be coded in a form that both computers understand. Computers cannot understand or process language the way you can. Computers can only process numbers. A code has to be used for all the numbers, letters, and symbols of our language. We'll take a look at a common computer code called ASCII.

Information



Push this button to go back

Push this button to go on



Space	!	Quote	#	$	%	&	Apostrophe	(	)	*	+	,	-	.	/
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

The ASCII code is a set of 256 characters (from 0 to 255) that a computer uses to store information and commands.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86

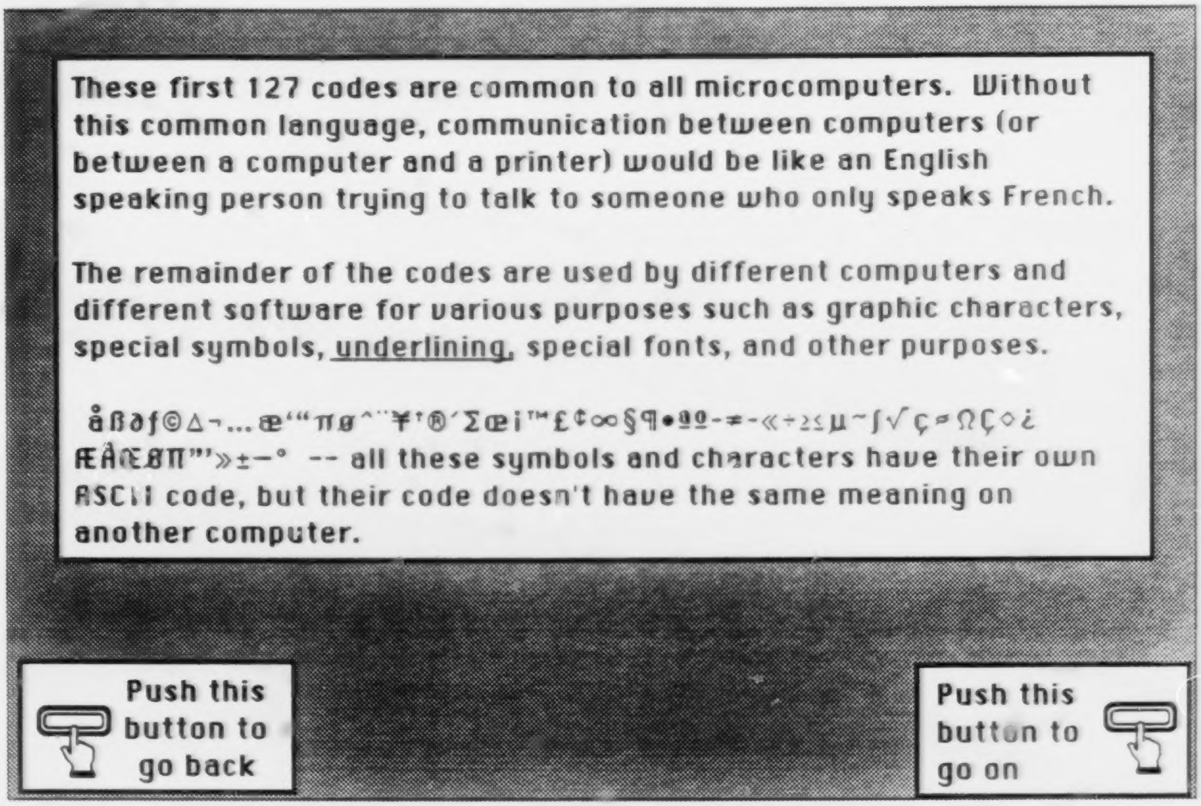
W	X	Y	Z	a	b	c	d	e	f	g	h	i	j	k	l	m
87	88	89	90	97	98	99	100	101	102	103	104	105	106	107	108	109

n	o	p	q	r	s	t	u	v	w	x	y	z
110	111	112	113	114	115	116	117	118	119	120	121	122

The first 32 codes are commands that control such things as backspacing, pausing, beep signals, tabs, escapes, line feeds, and carriage returns . The codes from 32-126 include the space, upper and lowercase letters, common symbols and punctuation, and the numbers from zero to nine.

Push this button to go back

Push this button to go on

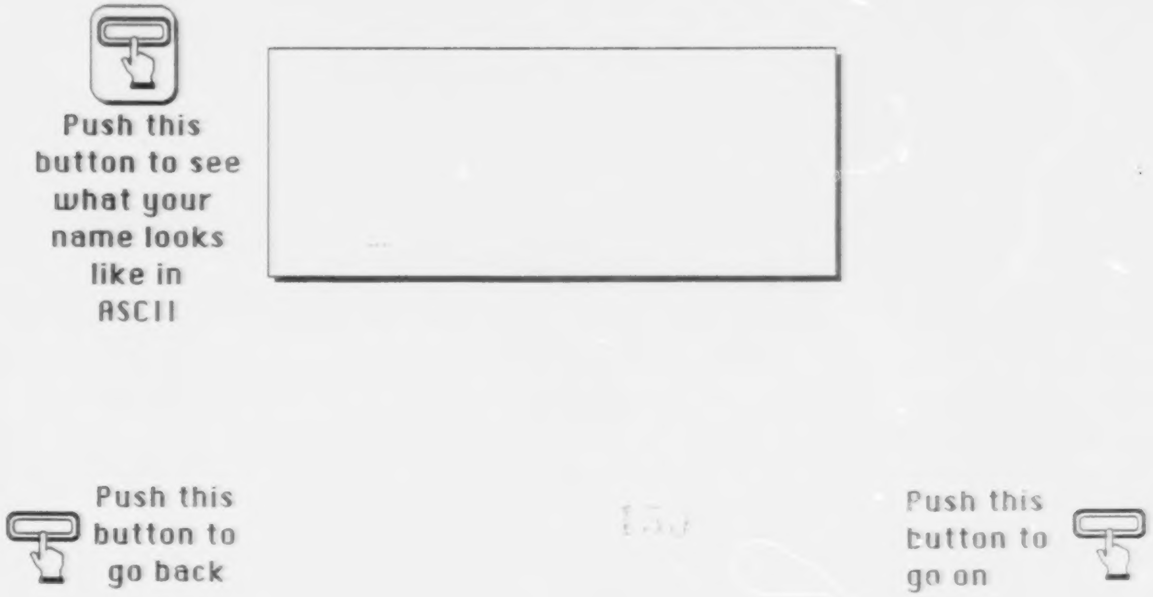


These first 127 codes are common to all microcomputers. Without this common language, communication between computers (or between a computer and a printer) would be like an English speaking person trying to talk to someone who only speaks French.

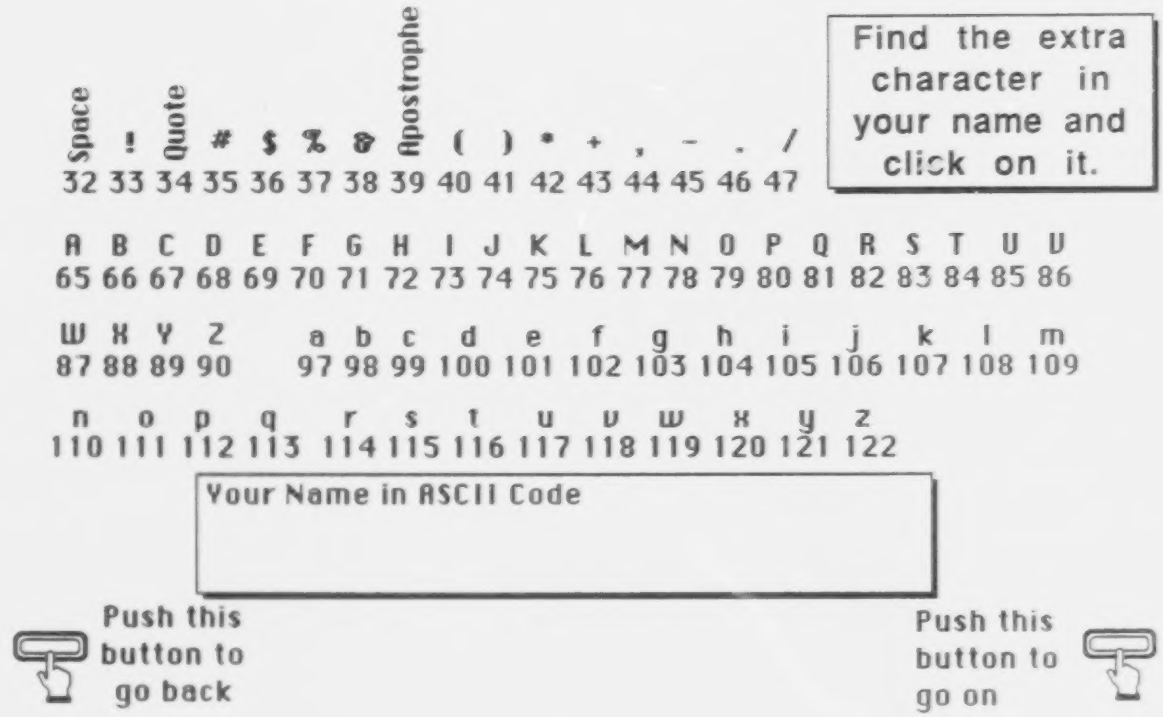
The remainder of the codes are used by different computers and different software for various purposes such as graphic characters, special symbols, underlining, special fonts, and other purposes.

åß∂ƒ©∆¬…æ‘“πøˆ¨¥†®´∑œ¡™£¢∞§¶•ªº–≠–«÷≥≤µ˜∫√ç≈ΩÇ◊¿ ÆÅŒßΠ”’»±—° -- all these symbols and characters have their own ASCII code, but their code doesn't have the same meaning on another computer.

Push this button to go back
Push this button to go on



Push this button to see what your name looks like in ASCII
Push this button to go back
Push this button to go on



Space	!	Quote	#	$	%	&	Apostrophe	(	)	*	+	,	-	.	/
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

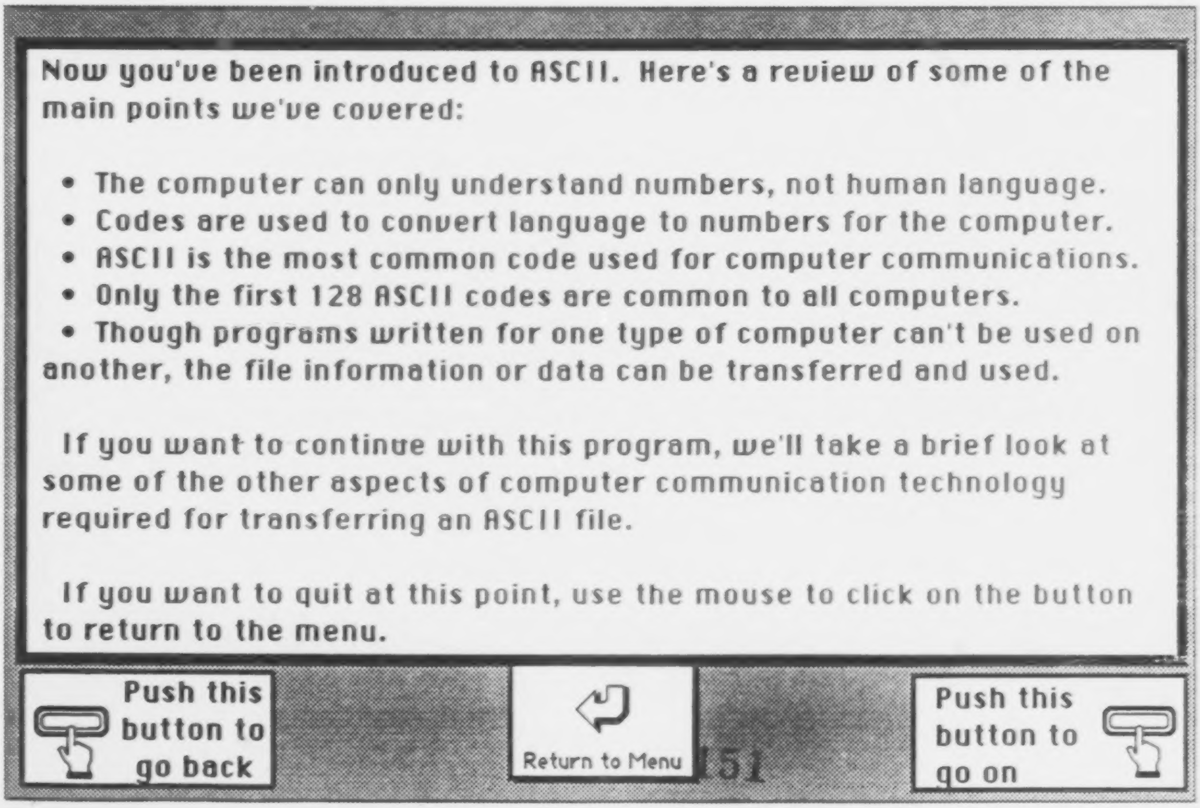
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86

W	X	Y	Z	a	b	c	d	e	f	g	h	i	j	k	l	m
87	88	89	90	97	98	99	100	101	102	103	104	105	106	107	108	109

n	o	p	q	r	s	t	u	v	w	x	y	z
110	111	112	113	114	115	116	117	118	119	120	121	122

Find the extra character in your name and click on it.

Your Name in ASCII Code

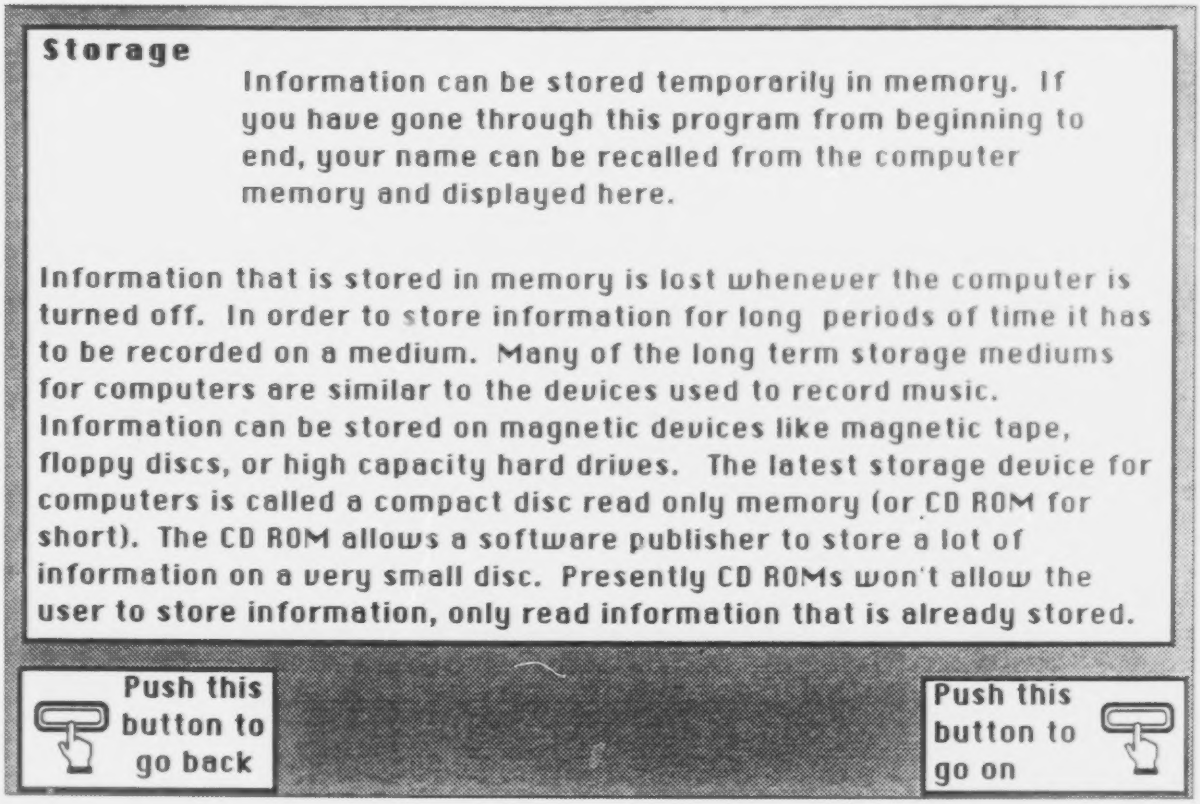


Now you've been introduced to ASCII. Here's a review of some of the main points we've covered:

- The computer can only understand numbers, not human language.
- Codes are used to convert language to numbers for the computer.
- ASCII is the most common code used for computer communications.
- Only the first 128 ASCII codes are common to all computers.
- Though programs written for one type of computer can't be used on another, the file information or data can be transferred and used.

If you want to continue with this program, we'll take a brief look at some of the other aspects of computer communication technology required for transferring an ASCII file.

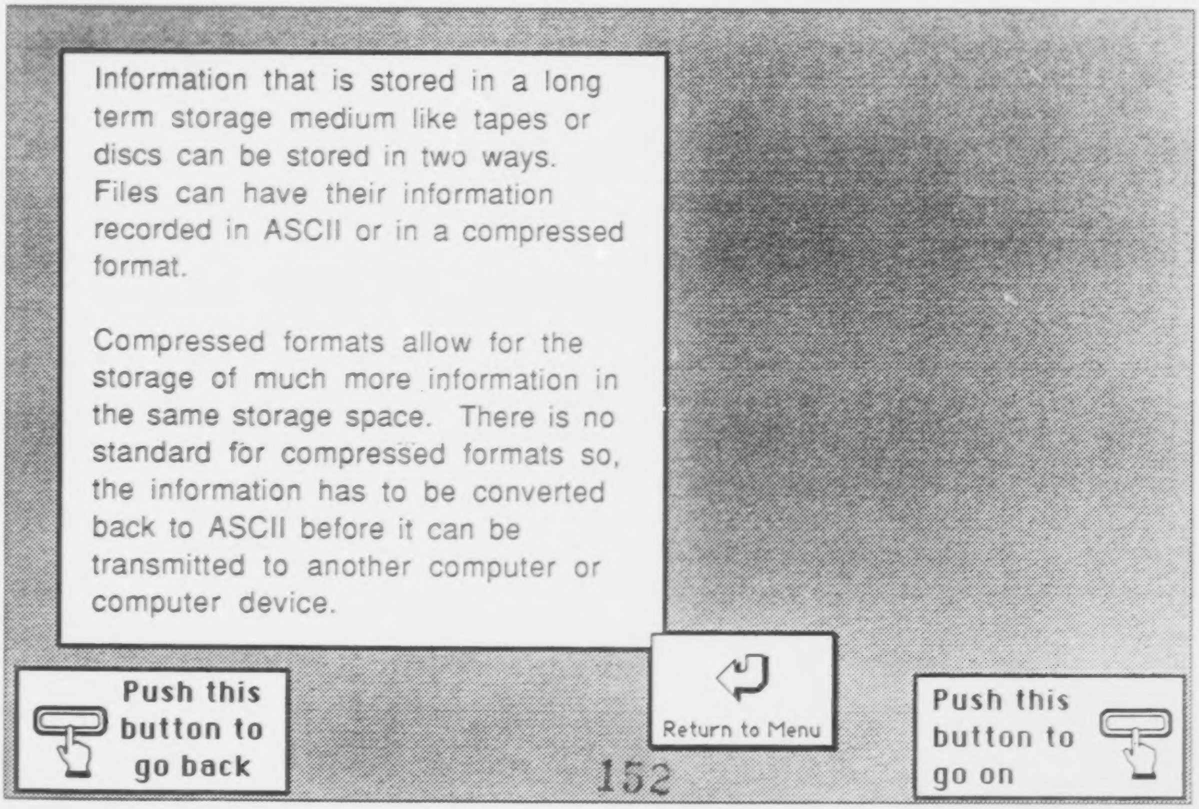
If you want to quit at this point, use the mouse to click on the button to return to the menu.



Storage

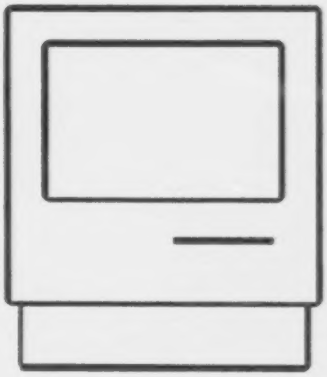
Information can be stored temporarily in memory. If you have gone through this program from beginning to end, your name can be recalled from the computer memory and displayed here.

Information that is stored in memory is lost whenever the computer is turned off. In order to store information for long periods of time it has to be recorded on a medium. Many of the long term storage mediums for computers are similar to the devices used to record music. Information can be stored on magnetic devices like magnetic tape, floppy discs, or high capacity hard drives. The latest storage device for computers is called a compact disc read only memory (or CD ROM for short). The CD ROM allows a software publisher to store a lot of information on a very small disc. Presently CD ROMs won't allow the user to store information, only read information that is already stored.



Information that is stored in a long term storage medium like tapes or discs can be stored in two ways. Files can have their information recorded in ASCII or in a compressed format.

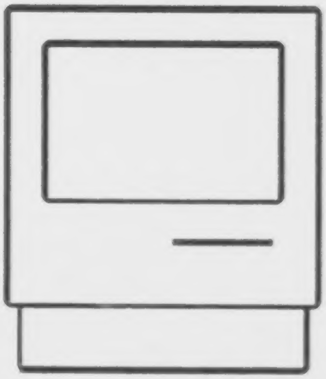
Compressed formats allow for the storage of much more information in the same storage space. There is no standard for compressed formats so, the information has to be converted back to ASCII before it can be transmitted to another computer or computer device.



Information that is stored has to be output for you to read it. The output device can be the computer monitor. . .

Push this button to go back

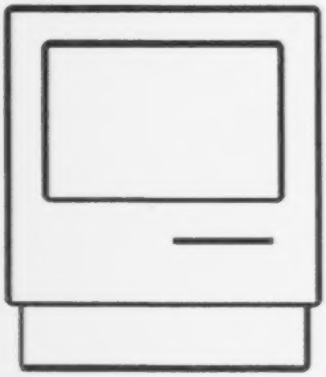
Push this button to go on

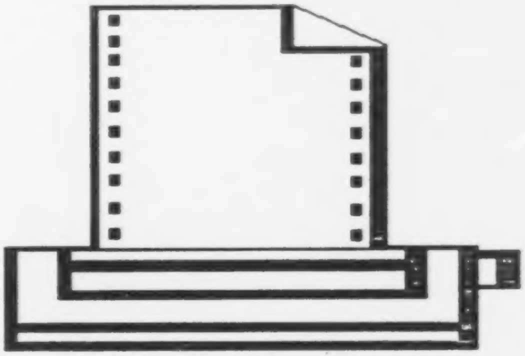


. . . or it can be a computer printer.

Push this button to go back

Push this button to go on



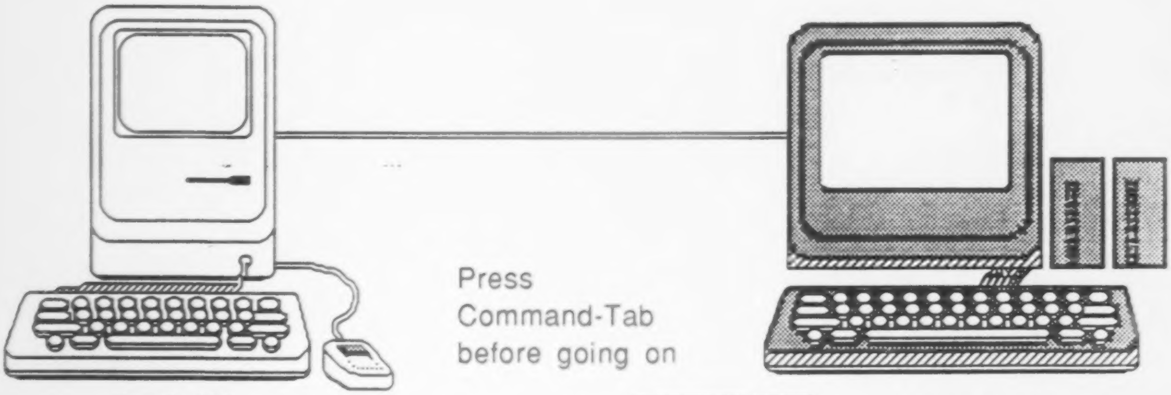


. . . or it can be a computer printer.

Push this button to go back

Push this button to go on

Output can also go to the serial port of the computer. The serial port is one of the multi-pin connectors usually on the back of the computer. The serial port sends and receives information in a series -- that is, one piece of information follows another sequentially



Press Command-Tab before going on

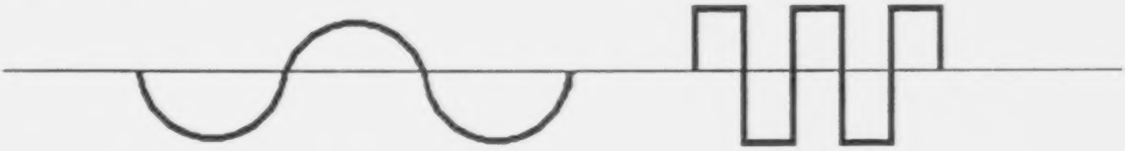
Push this button to go back

Return to Menu

Push this button to go on

If the computers you want to transfer information between are in the same room, all you need to do it connect them with a special cable. If the computers are separated by some distance you can connect them via the telephone.

The telephone is designed to transfer wave or analog information. Sound waves and the signal transferred by the telephone lines are continuously variable. Computer signals are descrete or digital (either on or off, nothing inbetween) and cannot be transmitted by telephone lines directly.



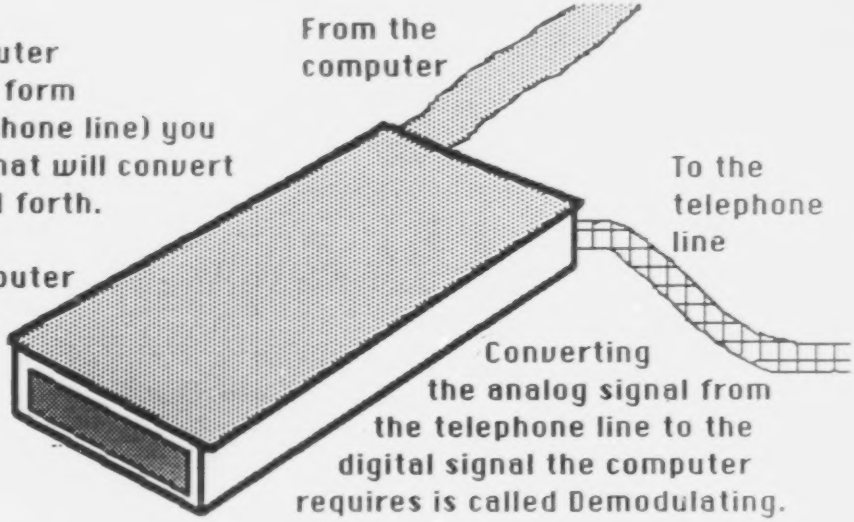
Analog Signal Digital signal

Push this button to go back

Push this button to go on

To change the computer signals to the wave form (needed bythe telephone line) you must use a device that will convert the signals back and forth.

Converting the computer digital signal to the analog signal the telephone requires is called Modulating.



Converting the analog signal from the telephone line to the digital signal the computer requires is called Demodulating.

The name for the device that does this is MODEM. This is a contraction of the terms MODulating and DEModulating.

Push this button to go back

Return to Menu

Push this button to go on

Computers linked together for the transfer of information have to have matching protocols. Protocols are the rules that govern how the information will be exchanged.

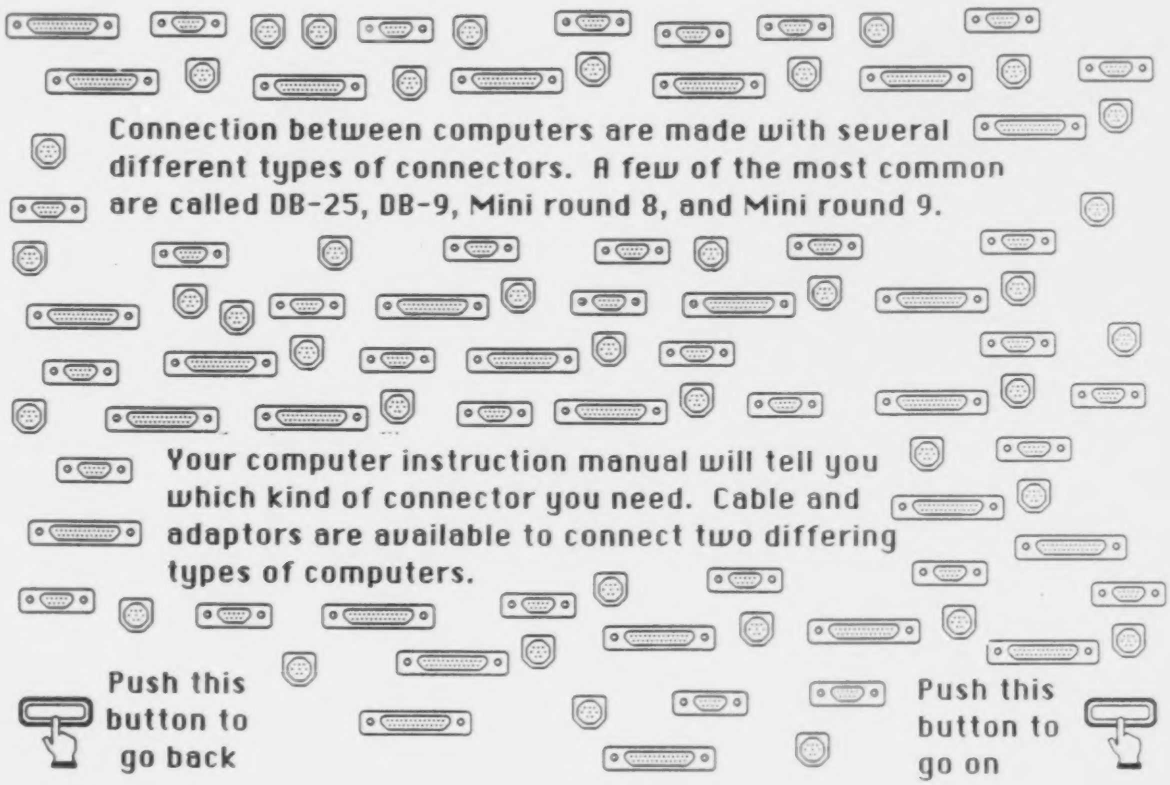
Some of the protocols are listed below. Use the mouse to click them for descriptions

Baud Rate
Stop bits
Data bits
Parity
Handshake

Push this button to go back

Return to Menu

Push this button to go on

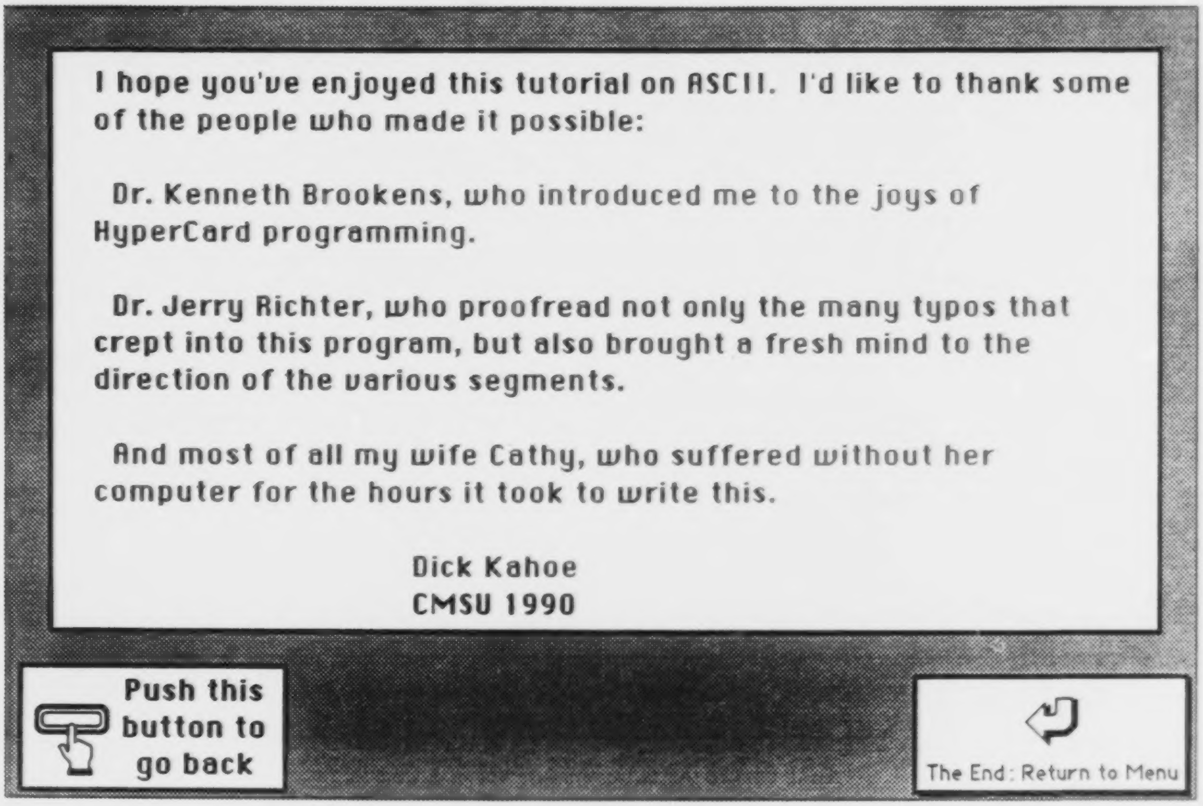


Connection between computers are made with several different types of connectors. A few of the most common are called DB-25, DB-9, Mini round 8, and Mini round 9.

Your computer instruction manual will tell you which kind of connector you need. Cable and adaptors are available to connect two differing types of computers.

Push this button to go back

Push this button to go on



I hope you've enjoyed this tutorial on ASCII. I'd like to thank some of the people who made it possible:

Dr. Kenneth Brookens, who introduced me to the joys of HyperCard programming.

Dr. Jerry Richter, who proofread not only the many typos that crept into this program, but also brought a fresh mind to the direction of the various segments.

And most of all my wife Cathy, who suffered without her computer for the hours it took to write this.

Dick Kahoe
CMSU 1990

Instructional Resources

Books and Articles:

Held, G. and Sarch, R. (1983) DATA COMMUNICATIONS: A COMPREHENSIVE APPROACH, New York. McGraw-Hill.

Cambron, J. (1984) THE FIRST PRIMER OF MICROCOMPUTER TELECOMMUNICATIONS. Blue Ridge Summit, PA. TAB Books.

Erickson, J. and Cramer, W. (1985) MAC TELECOMMUNICATIONS. Berkeley, CA. McGraw-Hill.

Kruglinski, D. (1984) GUIDE TO IBM PC COMMUNICATIONS. Berkeley, CA., McGraw-Hill.

Haas, L. (1984) GOING ON-LINE WITH YOUR MICRO. Blue Ridge Summit, PA. TAB Books.

Locicero, S. "A Computer in the Scholar's Lap: Direct File Transfers from Tandy 100 to Macintosh". ERIC (source temporarily lost).

Feldman, J. (March, 1987) THE CUSTOM CABLE CONNECTION. 80 Micro. pp. 62-65.

Management/Logistics

Related Tams

Another TAM in this guide, "On-line Computer Communications", utilizes the ASCII code for communication between a microcomputer and a bulletin-board system.

Evaluation/Grading

Successful resolution of this activity will be evaluated by the students' completion of the paper-pencil activity and the post-test.

Suggested Schedule/Time

The time suggested for this TAM can range from one class session for a paper-pencil activity to two weeks for all the BASIC and Hypercard programs.

Key Instructional Suggestions:

Safety

Careful attention should be given to common safety precautions for electrical devices. Beverages or other liquids should not be allowed to spill on the computer or keyboard. The voltages used in communication ports are low (+- 12 volts) and pose little hazard to the operator. To prevent damage to the equipment, the computer and any peripherals should always be switched off before connecting or disconnecting any cables. Instruct students that discs need to be handled by the jackets. Avoid exposing discs to liquids and magnetic fields.

The computer should be treated with the same care as any electronic device. 110 volt AC is present in the power supply, and higher voltages are present in the monitor. As the students work with the computer, they should be reminded to follow these safety precautions:

1. Beverages or other liquids should not be allowed to spill on the computer or keyboard. Do not set beverage containers on or around the computer.
2. To prevent damage to the equipment,shut off the computer, any printers, and disc drives before connecting or disconnecting any cables.
3. Computer discs need to be handled by the jackets, never touch the surface of the disc itself.
4. Never let the disc get wet or allow it to come near any magnetic field, such as the computer monitor a speaker or telephone.
5. Never open the case of the computer or monitor.
6. Do not obstruct the ventilation openings in the cases.
7. Never insert or remove a disc when the disc drive light is on.

Motivation

Many students have computers at home. They should be advised that comprehension of ASCII is a prerequisite to transferring information from their computer to another.

Prerequisite information

It would be helpful for the teacher and students to have had some previous experience with disc operating systems and other basic computer knowledge.

Demonstrations

The instructor should demonstrate all computer operation steps -- turning the system on, loading discs, basic operation, and shutting the computer down.

Reinforcement

The use of ASCII in computer telecommunications should be stressed.

159

Attitudes

For some time the prevalent attitude in computing has been that there's no way to transfer information between "incompatible", computer systems. It has been to the computer manufacturers' benefit to foster a "magic box" perspective about their products. Information is information, regardless of the operating system it was produced on. This TAM helps to dispel the incompatibility myth.

Summary & Review

The instructor should summarize and review the following:

1. The computer can only understand numbers-not language.
2. Codes are used to convert language to numbers for the computer.
3. ASCII is the most common code used for computer communications.
4. Only the first 127 ASCII codes are common to computers.
5. Though programs written for one type of computer can't be used on another, the file information or data can be transferred and used.

Glossary

ASCII - American Standard Code for Information Interchange. A code of 256 character/code combinations.

BASIC - A high-level language used to program a computer. BASIC, in one form or another, is available for every micro-computer.

Data - Information which is suitable for processing.

DOS - Disc Operating System. Software that controls and coordinates the input and output of the computer microprocessor. DOS controls the disc reads and writes, screen and port input and output.

GWBASIC - Microsoft's BASIC for IBM and compatible computers. Compatible with IBM's BASICA and Tandy BASIC.

HyperCard - An authoring language for the Macintosh computer. HyperCard combines elements of Object Oriented Programming with a scripting language.

Program - Instructions that tell the computer what to do.

Software - Computer programs that direct a specific task.

Pre-Assessment:

To measure prerequisite skills, the instructor should observe the students to evaluate computer and disc handling competence. Only general questions about previous knowledge should be asked, such as: Do you know what ASCII stands for? Do you have a microcomputer at home? If so, what kind?

Post-Assessment:

The questions in the review section would be appropriate for as short-answer-essay evaluation.

Review Questions & Answers

A. Why do computers need coded information? *Because computers process numbers only, not words or symbols.*
B. After a word processor, game, or other program is transferred from one type of computer to another, will it function the same? *No-only data can be used after transfer from one computer to another.*

C. What does ASCII stand for? *American Standard Code for Information Interchange.*

D. Do all computers use ASCII? *No, but most microcomputers can use ASCII.*

E. How many ASCII codes are there? *256, but only the first 127 are common to all the microcomputers that use ASCII.*

Technology Activity Module 2

USING ASCII

FOR COMPUTER TELECOMMUNICATIONS

by Dick Kahoe

Technology Activity Module 2

Student Component

Introduction:

The computer cannot read, process, or understand the English language as we know it. Nouns, verbs, conjunctions, punctuation, sentences, paragraphs are all beyond the computer's processing capability. A computer processes numbers only. In order for the computer to handle text, every character or symbol has to be coded as a number. American Standard Code for Information Interchange ASCII is one of the most widely used codes. Without a code like ASCII, trying to transfer information between two different types of computers would be like using Spanish to tell an English-speaker how to change a tire. Because of the wide variety of computers and software available, this TAM contains several different activities labeled according to their respective requirements. In this TAM you can encode your name in ASCII, prepare a file to be transferred between two different types of computers, and operate computer tutorial programs that illustrate or explain the ASCII code.

Competencies:

By completing this TAM, you will be able to:

1. Explain in writing the need to code computer information.
2. Using paper and pencil or the computer, encode or decode English text to ASCII.
3. Compare and contrast computer programs and computer data.
4. Compare and contrast the advantages of storing data in a compressed format or in an ASCII file.

Module Overview:

Motivational Statement

Without a standard code for data, information that's prepared on a computer couldn't be printed or transferred to any other computer. ASCII code is the most common means of transferring information. Another TAM uses ASCII to allow you to communicate with a computer bulletin board system.

Key Instructional Suggestions:

Demonstrations

1. Turning the computer on
2. Putting the discs in the drive
3. Loading the software

Safety

The computer should be treated with the same care as any electronic device. 110 volt AC is present in the power supply, and higher voltages are present in the monitor. As you work with the computer, be sure to follow these safety precautions.

1. Beverages or other liquids should not be allowed to spill on the computer or keyboard. Do not set beverage containers on or around the computer.
2. To prevent damage to the equipment, the computer, printers, and disc drives before connecting or disconnecting any cables.
3. Computer discs need to be handled by the jackets; never touch the surface of the disc itself.
4. Never let the disc get wet or allow it to come near any magnetic field such as the computer monitor or a speaker.
5. Never open the case of the computer or monitor.
6. Do not obstruct the ventilation openings in the cases.
7. Never insert or remove a disc when the disc drive light is on.

Glossary

ASCII - American Standard Code for Information Interchange. A code of 256 character/code combinations.

BASIC - Beginners All Purpose Symbolic Instruction Code. A high-level language used to program a computer. BASIC, in one form or another, is available for every micro-computer.

Data - Information which is suitable for processing.

DOS - Disc Operating System. Software that controls and coordinates the input and output of the computer microprocessor. DOS controls the disc reading and writing, screen, port, input and output.

GWBASIC - Microsoft's BASIC for IBM and compatible computers. Compatible with IBM's BASICA and Tandy BASIC.

HyperCard - An authoring language for the Macintosh computer. HyperCard combines elements of Object Oriented Programming with a scripting language.

Program - Instructions that tell the computer what to do.

Software - Computer programs that direct a specific task.

Needed Materials:

Equipment

- Computer: Apple II, IBM PC or compatible; Radio Shack TRS-80 Models I, III, IV, 100, 200, 600; Apple Macintosh; Amiga; or other micro-computer.
- Software: Operating System software for computer.
- BASIC
- HyperCard for use with the program, Tutorial on ASCII.

Handout

Student component of TAM.

Activity Sequence

Activity Options

Activity #1
IBM and Compatible Computers
Requires DOS

First, observe the instructor's demonstration of the steps to start the computer and load DOS.

Keyboard Input	*Procedure*
<ALT> 72	IBM and compatible computers have an ASCII conversion device readily available. Start the computer and load DOS. Turn the numeric lock on with the Num Lock key. Press the Alt key and hold it down while typing any ASCII code. When the Alt key is released the ASCII character is shown in the prompt line. Be careful about entering ASCII codes lower than 32 as DOS uses some of them to control movement of the cursor on the screen.
<ALT> 89	
<ALT> 36	
<ALT> 176	The ASCII codes from 176 to 223 are interesting. These are graphics characters used on MSDOS computers to make lines and borders.
<ALT> 201	

Activity #2

Any Microcomputer
Requires BASIC

	First, observe the instructor's demonstration of the steps to start the computer and load BASIC.
Load BASIC	A similar way of converting ASCII codes to ASCII characters is available on any microcomputer that has a BASIC interpreter. At the prompt type:
PRINT CHR$ (N)	Substitute the ASCII code that you want for the N. The computer will print the ASCII character to the screen.
PRINT ASC ("N")	Substitute the character that you want for the N. This time the character has to be in quotation marks. The computer will print the ASCII code to the screen. Don't type: PRINT ASC ("") unless you want to see how the computer deals with errors.
PRINT CHR$(7)	Try this ASCII code. Did you get a beep or a flash on the computer screen? ASCII 7 is a leftover from the days when printers were teletype devices. The bell was a signal that a message was coming in.

ACTIVITY #3

IBM and Compatibles and TRS-80 Computers
(Apple and Amiga Computers with changes)
Requires BASIC

An ASCII demonstration program, written in MicroSoft GWBASIC, is included in this TAM. The program should run with minor alterations on most microcomputers. The program uses the BASIC ASC and CHR$ commands to list and convert ASCII codes and characters.

To run the program, load BASIC into the computer and type the following listing. Be sure to save the program before running it.

```
10 REM ASCII DEMONSTRATION by Dick Kahoe
20 ON ERROR GOTO 40
30 KEY OFF
40 CLS
50 PRINT:PRINT:PRINT:PRINT"                    M E N U"
60 PRINT
70 PRINT"          1. List the ASCII Codes and Characters
80 PRINT
```

```
90 PRINT"              2. Convert ASCII Code to ASCII Character
100 PRINT
110 PRINT"              3. Convert ASCII Character to ASCII Code
120 PRINT
130 INPUT"Type the number of the menu item";X
140 ON X GOTO 170,330,380
150 CLS:GOTO 50
160 END
170 CLS:FOR N = 32 TO 99
180 PRINT "ASCII ";N;
190 PRINT "= ";CHR$(N);
200 PRINT "   ";
210 FOR T = 1 TO 500 : NEXT T
220 NEXT N
230 FOR N = 100 TO 126
240 PRINT "ASCII ";N;
250 PRINT "= ";CHR$(N);
260 PRINT "  ";
270 FOR T = 1 TO 500:NEXT T
280 NEXT N
290 PRINT
300 PRINT:PRINT "Press any key to return to the menu"
310 IF INKEY$ = "" THEN GOTO 310
320 GOTO 40
330 CLS:REM ASCII CODE TO ASCII CHARACTER
340 PRINT:INPUT "Type any ASCII Code here (or 0 to return to
menu)" ;N
350 IF N = 0 THEN GOTO 40
360 PRINT:PRINT "ASCII" N "= " CHR$(N)
370 PRINT "  ";:GOTO 340
380 CLS:REM ASCII CHARACTER TO ASCII CODE
390 PRINT "Type any single character or symbol and press <ENTER>
400 INPUT "( <ENTER> alone returns to Menu)     ";A$
410 PRINT:PRINT "The ASCII Code number for ";A$;:PRINT" is";ASC
(A$):PRINT
420 GOTO 390
```

The program should run without any changes on TRS-80 computers. For Applesoft Basic, change the semicolon in lines 130, 340, and 400 to commas. Other changes may be necessary.

The program has only been tested on a Toshiba and an Amiga computer. For Amiga BASIC, change the following lines:

```
20 ON ERROR GOTO 30
30 RESUME 40
40 CLS:WIDTH 80
240 PRINT ;TAB(P);"ASCII";N;"= ";CHR$(N);
250 P = P + 16: IF P > 68 THEN P = 1
DELETE LINE 260
```

Run the program following the menu prompts. The program will show the ASCII codes, convert ASCII code to ASCII characters, and convert ASCII characters to ASCII code.

ACTIVITY #4

For All Microcomputers
Requires BASIC

First, observe the instructor's demonstration of the steps to start the computer and load BASIC.

LOAD BASIC	A computer uses ASCII to communicate with it's peripherals like the disc drives and the printer. An ASCII file is a rather bare bones file. It contains nothing but information; there are no formatting instructions, no control codes, just text. The files stored on discs can be stored in a compressed format to save space, or they can be stored in ASCII format. Different operating systems and other software use different schemes for compressing data for storage
LOAD "YOURFILE"	To see the difference between a compressed file and an ASCII file, load the ASCII Demonstration program into the computer's memory (using whatever name you saved it under) and save it again.
SAVE "ASCTEXT",A	Save the file again using the command at the left. The file will not overwrite the existing file because you've given it a new name. You will now have two copies of the program. The ",A" tells the computer to save the file in ASCII format.
Return to DOS LIST YOURFILE LIST ASCTEXT	From the DOS prompt LIST the two files to the screen. Both files contain the same information. The two files should have obvious differences when they're listed to the screen. If the files look the same, check to make sure that you typed the SAVE command with the ",A" correctly. The compressed file takes less storage space on the disc. The ASCII file is in a form that can be transferred to another computer. There are similar differences between proprietary file formats for any other software and their ASCII files.

Activity # 5

For Macintosh Computers
Requires **Hypercard**
and **Tutorial on ASCII** (the tutorial is available free
by sending an Apple-Macintosh 3 1/2" disk and self addressed stamped mailer to:
Jerry Richter,
Department of Graphics,
Central Missouri State University,
Warrensburg, Missouri 64093.)

First, observe the instructor's demonstration of the steps to start the Macintosh and load the discs.

This TAM includes an Apple Macintosh disc that contains a **Hypercard** tutorial on ASCII. The program presents information and requests input from you through the keyboard and the mouse. To use the tutorial program, insert the disc and a disc containing the **Hypercard** program into the computer. Double click on the icon named ASCII. The program will start and guide you through the tutorial.

ACTIVITY #6

ASCII Code Worksheet
(requires no computer)

A handout sheet is included with this TAM (see next page) that lists the ASCII codes and characters and gives a brief explanation of ASCII. Translate the characters to codes and codes back to characters.

Post-Assessment:

Review questions.--Test yourself!

1. Why is a code necessary for computers?
2. Are all the ASCII codes used by all computers?
3. Can software programs be transferred from one type of computer to another?
4. Can data be transferred from one type of computer to another?

Instructions:

1. Complete the paper and pencil activity #6.
2. Complete the Post-test given by your teacher for this TAM.

Summary and Wrap-up

No TAM could cover all the uses for the ASCII code. But you should now have some concept of how useful ASCII code can be for transferring information from one computer to another.

Technology Activity Module 3

COMPUTER AIDED

DRAFTING

by Kyle Palmer

Technology Activity Module 3

Instructor Component

Activity Objectives:

The purpose of this TAM is to familiarize students with the components and operations of a computer aided drafting system (CAD). The student activities include using input and output devices, setting parameters, generating simple drawings, and editing existing drawings.

Target Competencies:

By completing this TAM, the student will be able to:

1. Describe the components of a computer aided drafting system (CAD).
2. Use CAD input devices such as keyboards, mice, and digitizing tablets.
3. Set parameters such as grid, snap, and layers that are needed to begin a CAD drawing.
4. Store and retrieve data on a CAD system.
5. Employ the proper CAD techniques and equipment in generating a simple drawing (basic entity, secondary entity, modify).
6. Insert applicable text, including dimensions and notes.
7. Edit an existing CAD drawing.
8. Use CAD output devices, including monitors, plotters, and printers.

TAM Instructions:

Introduction

This TAM guides students through the creation of a drawing using a computer aided drafting system (CAD). It is recommended that the instructor point out that CAD is only a tool--like a drafting machine--and students still need basic drafting skills. The activities include: demonstrations, pre- and post-tests, using input and output devices, setting parameters, generating drawings, and editing existing drawings.

Safety Considerations

The only safety concern when using a CAD system is that students keep loose clothing away from moving parts on the plotter.

Needed Materials:

Supplies Required

a. Paper
b. Plotter pen

Equipment/Machines/Tools

a. Computer (keyboard, CPU, monitor)
b. Input device (mouse or tablet)
c. Output device (printer and/or plotter)
d. Software (CADKEY, AUTOSKETCH, etc.)

Handouts

Student component of TAM

Instructional Resources

a. Books

Cooper, R.E., INTRODUCTION TO VERSACAD. (Columbus, OH, Merrill Publishing Co., 1990)

Duelm, B.L., COMPUTER AIDED DRAFTING: FUNDAMENTAL AND APPLICATIONS. (South Holland, IL, Goodheart-Willcox Company, 1989)

Goetsch, D.L., MICROCADD: COMPUTER AIDED DESIGN AND DRAFTING ON MICROCOMPUTERS. (Englewood Cliffs, NJ, Prentice Hall, 1988)

Keedy, H.F., AN INTRODUCTION TO CAD USING CADKEY. (Boston, MA, PWS-Kent 1988)

Reichhard, D.C., EXPLORING CADKEY. (Englewood Cliffs, NJ, Prentice-Hall, 1988)

Schmaker, M.T., Madsen, D.A., AUTOCAD AND ITS APPLICATIONS. (South Holland, IL, Goodheart-Willcox Company, 1989)

b. Some suggested software:

IBM	
CADKEY 1	-- $ 98
CADKEY LIGHT	--$ 299
CADKEY 3	--$1295 (discount multi-work stations)
CADKEY curriculum	$295-$495

CADKEY Inc.
440 Oakland street
Manchester, CT 06040-2100
(800) 654-3413

AUTOSKETCH	--$ 99
AUTOCAD	--$1625

Educational Marketing Rep.
Hagerman & Company, Inc.
Broadway and Sunset Court
Mt. Zion, IL 62549
(800) 422-0313

*APPLE	
CADDRAW	--$119
DISCOVER CAD	--$209
DISCOVER CAD II	--$325

*Apple prices per workstation as of Jan '90.

Management and Logistics

Evaluation and Grading

a. Pre-and post-test students.
b. Sixty percent on the weight of laboratory work and forty percent on the written examination is appropriate.

Suggested Schedule

Two to three weeks is the suggested time for the completion of this module. A longer time period could be used by adding other drawing assignments.

Key Instructional Suggestions:

Safety

Remember to tell students to keep loose clothing away from moving parts on the plotter.

Motivation

a. For distribution to students, the instructor could make plots of sophisticated drawings like the space shuttle.
b. Take a field trip to a local company that uses CAD.

Prerequisite information

A basic knowledge of drafting skills, the Cartesian coordinate system and descriptive geometry would be useful.

Demonstration

a. Setting drawing parameters
b. Storing and retrieving drawings
c. Generating a drawing
d. Plotting

Reinforcement

Interact with the school's mathematics/geometry instructors to cooperatively work on the coordinate system and geometry principles used in computer aided drafting.

Attitudes

a. Encourage students to remember that the drawings they generate will need to be read by others.
b. Use good drafting practices while working on CAD.

Remediation/Enrichment

a. Slower students could spend extra time viewing CAD tutorial videos.
b. Have advanced students generate more complicated drawings, a symbol library, and/or architectural or electrical drawings.

Summary and Review

a. Components of a CAD system
b. Using input/output devices
c. Setting parameters
d. Storing/retrieving data
e. Steps in generating a drawing
f. Editing a drawing
g. Plotting a drawing

Review Questions:

1. Name at least four input devices used in CAD.
Answer: Mouse, digitizing tablet, scanner, joystick

2. What parameters can be set before creating a drawing?
Answer: Snap, grid, paper size, scale, layers

3. Name five modifying commands.
Answer: Delete/erase, trim, copy, move, mirror

Glossary

Basic entity - drawing features, such as lines, circles, arcs, and splines.

Delete/erase - command used to negate or remove a particular construction; commonly used with entities, window, group, or all.

Digitizing Tablet - an input device having a flat surface on which work is done. A stylus or puck is used for graphical entry. Information is transmitted to the monitor by means of an electrically controlled grid beneath the tablet's surface.

Format - organizing the surface of the diskette into a format readable by the computer.

Grid - a network of equally spaced reference points (dots) which cover the graphics screen and may be used as a reference when creating a drawing.

Input device - a mechanism used to interact with a computer or to input data, such as keyboards, mice, digitizing tablets, and scanners.

Layer(s) - a drawing may be thought of as being composed of a series of layers; each layer can be thought of as a clear overlay. Most systems have at least 256 layers. Related details can be placed on the same layer. Unrelated details can be placed on separate layers.

Modify - to alter a drawing file using any of the modifying commands, such as delete/erase, trim, move, copy, rotate, mirror, chamfer.

Mouse - a graphic input device used by rolling the device across the top of a desk or table.

Output device - a mechanism used to produce hard copies of images or data created with a computer, such as monitors, plotters, and printers.

Parameters - data that control the operation of a computer system; often used to modify default conditions. (e.g., snap, grid, scale, layers, text height)

Secondary entity - drawing features such as crosshatching and symbols.

Snap - locks the drawing cursor to snap or grid points as you move across the screen.

Trim - allows a user to alter (stretch or shorten) the existing end points of a line, as in trimming a line back to its intersection with another line.

Pre-Assessment:

Directions: Circle T for true and F for false.

1. In general, CAD is faster than traditional drafting. T F
2. The CAD operator does not need to know anything about drafting. T F

Directions: Circle the letter of the correct answer.

3. The impact of CAD will be to:
   a. Eliminate the need for anyone to learn drafting.
   b. Put drafters out of work.
   c. Require drafters to learn programming.
   d. Require that drafters learn new skills.

4. Which of the following is an output device that uses a pen?
   a. Monitor
   b. Plotter
   c. Printer
   d. Scanner

Directions: Fill in the blanks with the correct answers.

5. Name four input devices used in CAD:

   a.________________

   b.________________

   c.________________

   d.________________

Post-Assessment:

Directions: Circle T for true or F for false.

1. Once a drawing has been saved, it can be retrieved and edited. T F

Directions: Circle the letter of the correct answer.

2. Which one of the following is not an output device?
   a. Monitor
   b. Scanner
   c. Plotter
   d. Printer

3. Which of the following is a flat surface device used with a stylus or pen to input data points?
   a. Printer
   b. Mouse
   c. Scanner
   d. Digitizing tablet

Directions: Fill in the blanks with the correct answers.

4. Before using a diskette for data storage, what operation must be performed?

____

5. Name four basic entities used in CAD.

a.____________________

b.____________________

c.____________________

d.____________________

Pre- & Post-Test Answers:

Pre-test answers:
1. T
2. F
3. D
4. B
5. Keyboard, mice, digitizing tablet, scanner

Post-test answers:
1. T
2. B
3. D
4. Formata
5. Line, circle, arc, spline

Technology Activity Module 3

COMPUTER AIDED

DRAFTING

by Kyle Palmer

Student Component

Introduction:

Computer aided drafting (CAD) is an innovation that has been developed to make drafting more productive. Just as drafting machines, electric erasers, templates, reprograhic drafting, etc. were improvements, CAD is the newest innovation in the drafting field. An understanding of CAD basics will help you see how design ideas are communicated between people. It will also demonstrate the various information encoding techniques and the storage and retrieval of information.

In this module, you will use input and output devices, set drawing parameters, generate a simple drawing, edit an existing drawing, and plot a drawing.

Competencies:

By completing this TAM, the student will be able to:

1. Describe the components of a computer aided drafting system (CAD).
2. Use CAD input devices such as keyboards, mice, and digitizing tablets.
3. Set parameters like grid, snap, and layers that are needed to begin a CAD drawing.
4. Store and retrieve data on a CAD system.
5. Employ the proper CAD techniques and equipment in generating a simple drawing (basic entity, secondary entity, modify).
6. Insert applicable text including dimensions and notes.
7. Edit an existing CAD drawing.
8. Use CAD output devices, including monitors, plotters, and printers.

Module Overview:

This module contains two activities, each with several parts. The outcome of these activities will be the ability to create a drawing on CAD and obtain a plot. Other parts of these activities include: setting parameters, storing and retrieving drawings, and editing an existing CAD drawing.

Motivational statement

The use of CAD equipment is both fun and educational. Your instructor will demonstrate the equipment to you. With practice you will soon develop a beginning knowledge of one of the most important design tools used today.

Relationship to Context

Computer Aided Drafting equipment represents an example of machine-to-machine communication system. Like any communication system, it has a sender, transmission channel, receiver and information storage system. Try to relate these parts with those of other communication systems discussed in other TAMs.

Key Instructional Suggestions:

Class Presentations

a. Components of a CAD system
b. Cartesian coordinate system

Demonstrations

a. Setting drawing parameters
b. Storing and retrieving drawings
c. Generating a drawing
d. Plotting

Safety

The only safety concern when using a CAD system is keeping loose clothing away from moving parts on the plotter.

Personal Activity

Before beginning work on these activities, it is recommended that you read:

Duelm, B.L. COMPUTER AIDED DRAFTING: FUNDAMENTAL AND APPLICATIONS. (South Holland, IL, Goodheart-Willcox Company, 1989)

Keedy, H.F. AN INTRODUCTION TO CAD USING CADKEY. (Boston, MA, PWS-Kent, 1988)

Other

Additional information will be provided to you by films and/or instructor demonstrations/presentations.

Needed Materials:

Supplies

a. Paper
b. Plotter pens

Equipment/Machines/Tools

a. Computer (keyboard, CPU, monitor)
b. Input device (mouse or tablet)
c. Output device (printer and/or plotter)
d. Software (CADKEY, Auto CAD, AUTOSKETCH, Versacad, etc.)

Handouts/Instructional Resources

See Personal Activity above.

Pre-Assessment:

Discuss the general concept of computer aided drafting as an important design tool. During the course of the conversation, ask students informal questions such as: What does CAD stand for? What is a plotter? How do you boot up the computer? Have you ever used a computer like this before? Based on the responses, adjust your teaching approach to reflect the student's level of knowledge.

Plan of Procedure

ACTIVITY #1

Create a CAD drawing

A. Start up
  1. Turn on computer, monitor & printer/plotter.
  2. Format disk.
  3. Load software.

B. Set drawing parameters
  1. Set the grid to 1".
  2. Turn the grid on.
  3. Set the snap to .125".
  4. Turn the snap on.
  5. (On some systems you will need to set the paper size and scale).
  6. Set the text height to .125".

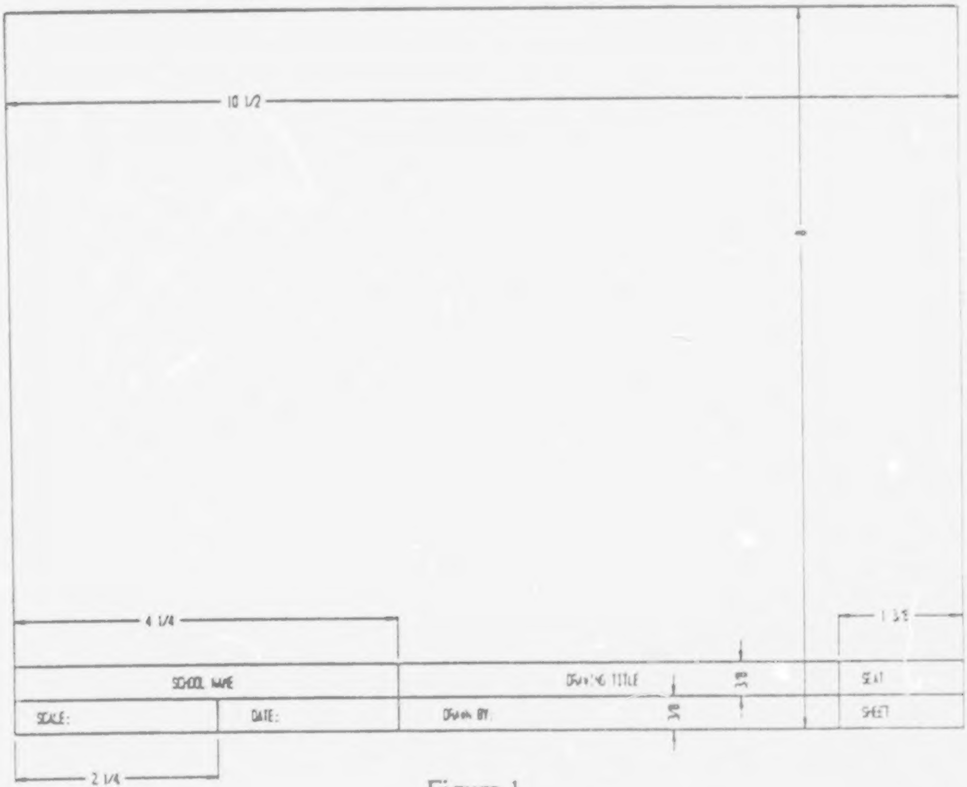
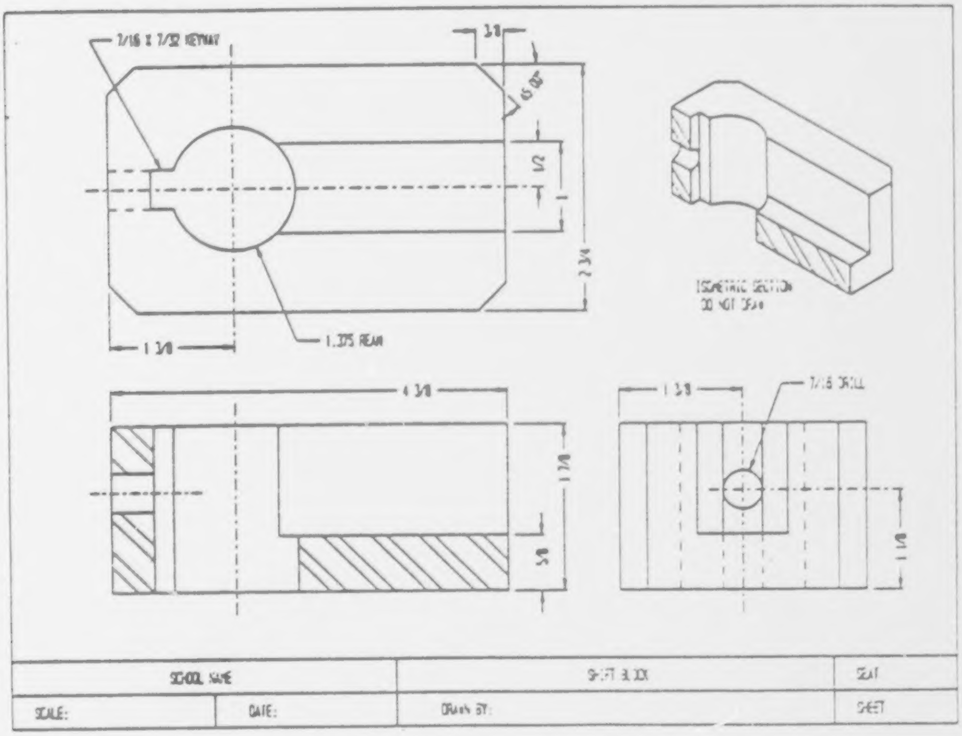


Figure 1

C. Border lines and title block (see Fig. 1)

1. Draw the outside border. (Use rectangle feature, if available.)
2. Add horizontal and vertical lines to create the title block area.
3. Use the text feature to enter title block information.
4. Save as a file (part) names TITLEBLK to be merged with a drawing file (pattern).

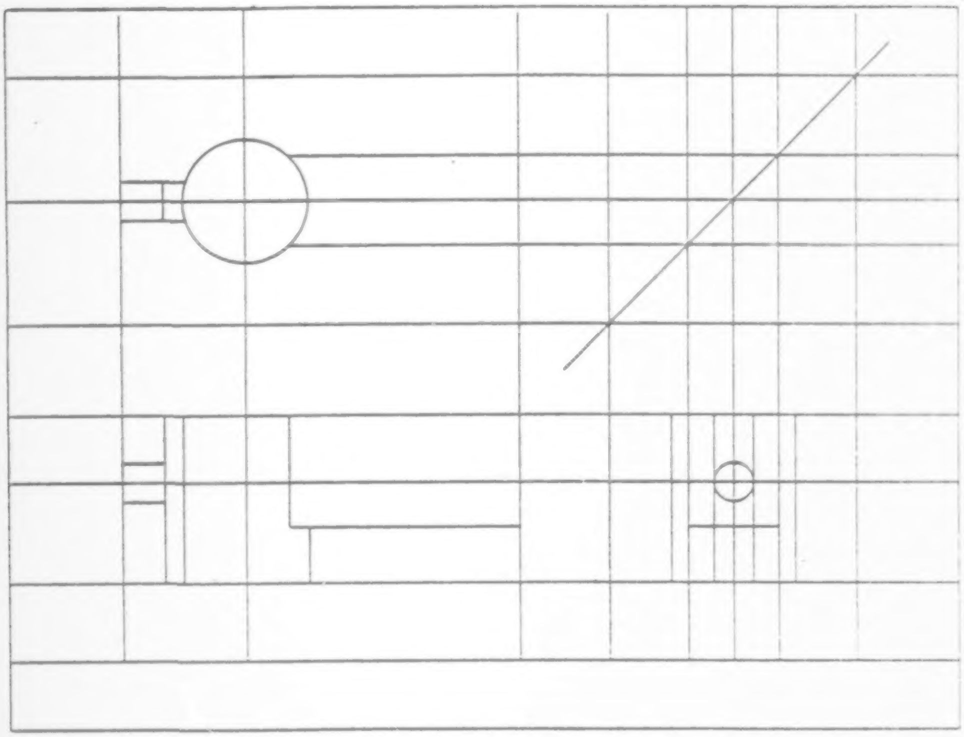

7/16 X 7/32 KEYWAY
3/8
45°
1/2
1
2 3/4
1 3/8
1.375 REAM
ISOMETRIC SECTION
DO NOT DRAW
4 3/8
1 7/8
5/8
1 3/8
7/16 DRILL
1 1/8
SCHOOL NAME
SHIFT BLOCK
SEAT
SCALE:
DATE:
DRAWN BY:
SHEET

Note: This drawing is from the book Basic Technical Drawings by H.C. Spencer and J.T. Dygdon (1980), Macmillan Publishing Co. It was drawn using CADKEY software.

Figure 2

D. Create the drawing in Figure 2 (only front, top, and right side views with dimensions).

****



****

Figure 2-A

1. Basic entity creation (see Fig. 2-A)
    a. Construct lines
        (1) vertical/horizontal
        (2) string
        (3) end points
        (4) parallel
    b. Construct arcs and circles

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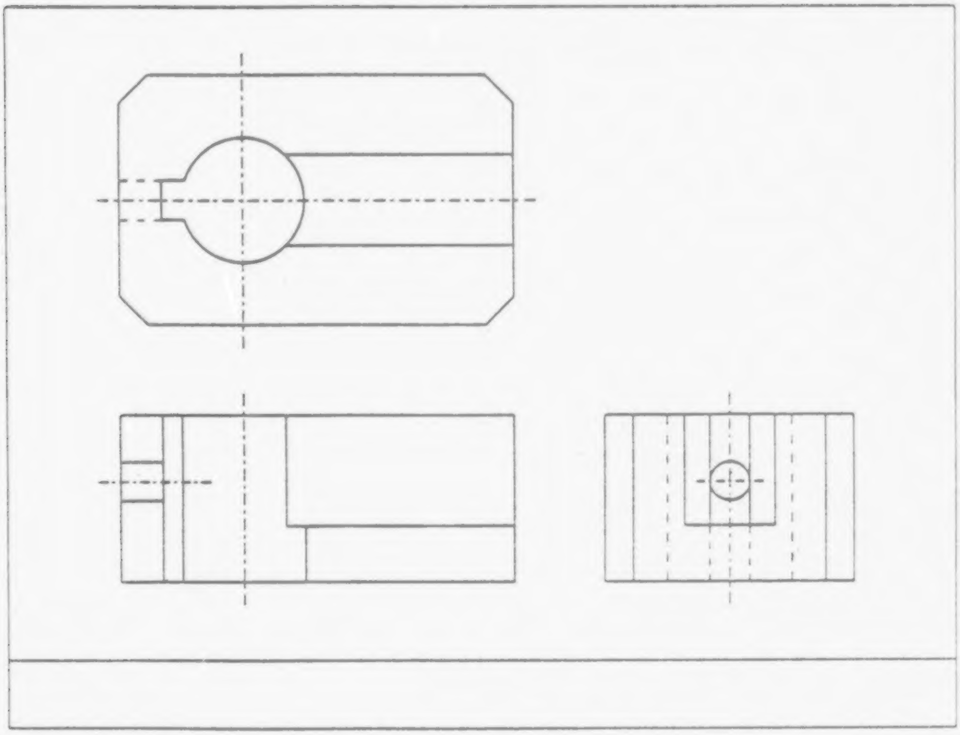
****

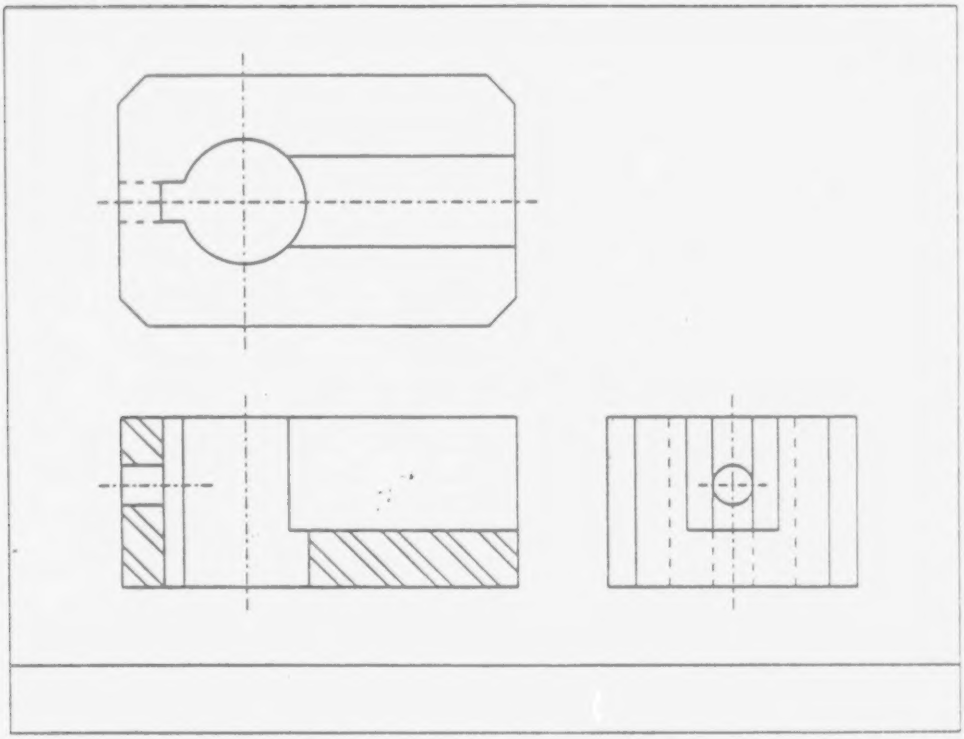


****

Figure 2-B

2. Modifying drawing entities (see Fig. 2-B)
    - a. Chamfer
    - b. Trim
    - c. Change line types
    - d. Delete/erase
    - e. Copy
    - f. Mirror
    - g. Move

****



****

Figure 2-C

3. Secondary entity creation (see Fig. 2-C)
    a. Change current layer
    b. Add crosshatching

4. Save as a file (pattern) names SHIFTBLK to be merged with the file (part), TITLEBLK.

5. Merge drawing file (pattern), SHIFTBLK, with the border line/title block file (part), TITLEBLK. Then, save as a file (part) named SHIFTBLK.

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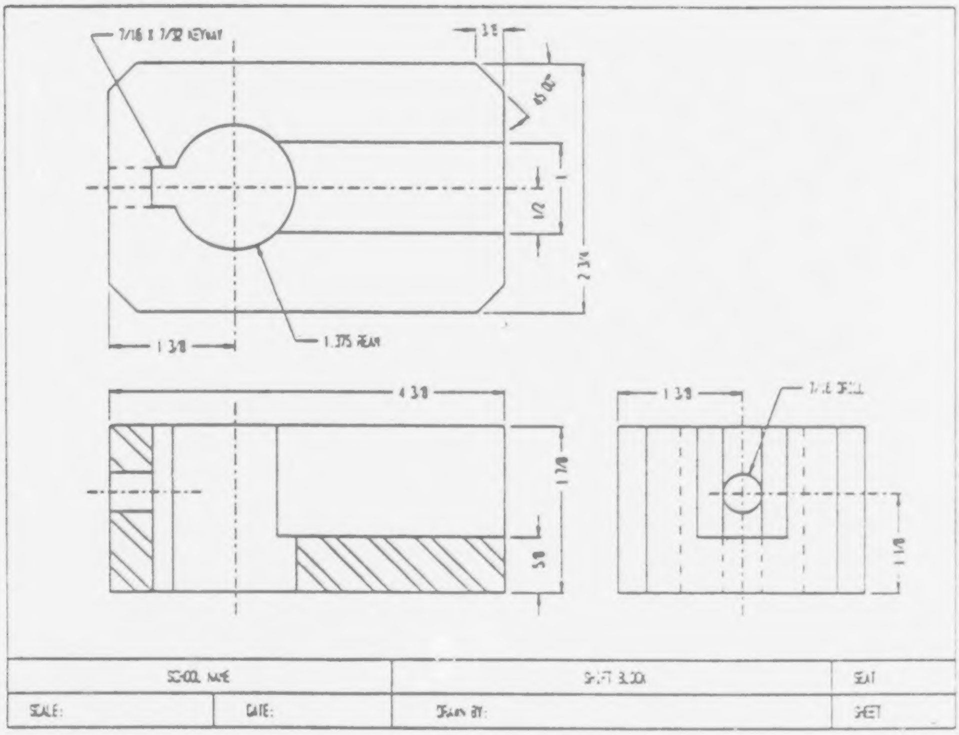
****


7/16 X 7/32 KEYWAY
3/8
45.00°
1
1/2
2 3/4
1 3/8
1.375 REAM
4 3/8
1 7/8
5/8
1 3/8
7/16 DRILL
1 1/8
SCHOOL NAME
SHIFT BLOCK
SEAT
SCALE:
DATE:
DRAWN BY:
SHEET

****

Figure 2-D

E. Edit the existing drawing by adding dimensions and text. (see Fig. 2-D)
   1. Retrieve the drawing file (part), SHIFTBLK.
   2. Insert correct dimensions.
      a. Linear
      b. Angular
      c. Diameter
   3. Insert needed notes.
   4. Save edited drawing file (part), SHIFTBLK.

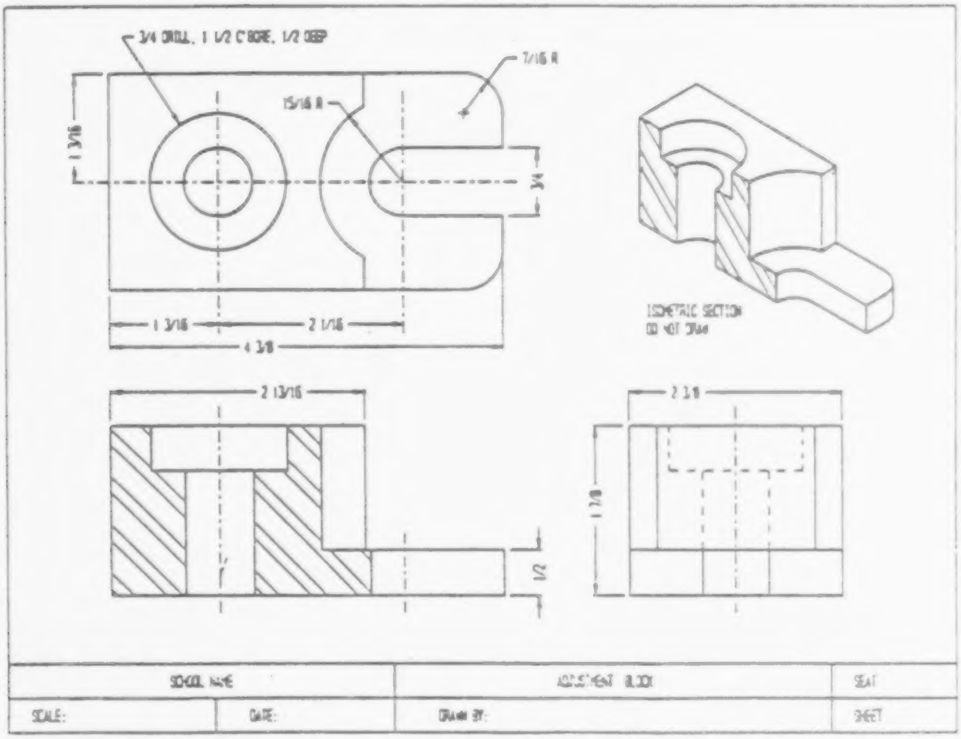
F. Plot the drawing (printer or plotter).

   1. Set-up plotter/printer.
   2. Follow the steps for your system.

ACTIVITY # 2

Create another CAD drawing

****


3/4 DRILL, 1 1/2 C'BORE, 1/2 DEEP
7/16 R
15/16 R
1 3/16
3/4
1 3/16
2 1/16
4 3/8
ISOMETRIC SECTION
DO NOT DRAW
2 13/16
1/2
2 3/8
1 7/8
SCHOOL NAME
ADJUSTMENT BLOCK
SEAT
SCALE:
DATE:
DRAWN BY:
SHEET

Note: This drawing is from the book Basic Technical Drawing by H.C. Spencer and J.T. Dygdon (1980), Macmillan Publishing Co. It was drawn using CADKEY software.

Figure 3

A. Create the drawing in Figure 3 (only front, top, and right side views with dimensions).
  1. Use steps similar to Activity #1.
  2. Use the border line and title block shown in Figure 1.

B. Plot the drawing (printer or plotter).
  1. Set-up plotter/printer.
  2. Follow the steps for your system.

Post-Assessment:

Instructions:
1. Complete the post-test.
2. Have your instructor compare the test scores and discuss the results.
3. If your results demonstrate mastery, go on to the next TAM or activity assigned by your instructor. If less than completely successful, see your instructor and plan what to do to raise your level of mastery.

Summary and Wrap-up

This module has introduced to you the basics of computer-aided drafting. By completing the activity portion of this module you have learned to use input and output devices, set drawing parameters, store and retrieve drawings, create a simple drawing, and edit an existing drawing. The CAD system that you are working on has many more functions; spend time experimenting. Having a knowledge of CAD will help prepare you for a future which depends on computers.

Technology Activity Module 4

DESKTOP PUBLISHING

by Mark Rankin

Technology Activity Module 4

Instructor Component

Activity Objectives:

"Desktop publishing" means producing a document which contains both text and graphics on a personal micro computer without any manual cutting and pasting of any elements. This TAM activity will guide students through the procedures necessary to produce a newsletter containing both text and graphics on the Macintosh computer.

Target Competencies:

After finishing this TAM the student will be able to:

1. Produce design sketches of a newsletter which contains multiple columns, art or graphics created on the computer, a customized masthead, subheadings, and a tint panel.
2. Create art or graphics using the computer program MacDraw II and transfer them via the clipboard function to a MacWrite II file.
3. Correctly utilize the capabilities of MacWrite II to produce a multi-column newsletter to the specifications indicated on the design sketch.

TAM Instructions

Introduction

This activity will guide the student through the design and production stages necessary to publish a multi-column newsletter which contains text, graphics, and a customized masthead. The customized masthead will include the title of the newsletter, a newsletter logo, issue number, and publication date.

Safety Considerations

Never remove the cover of an electronic device, such as a computer. There are no user-serviceable parts inside, and some electronic components retain a high voltage charge which could cause serious shock or electrocution.

Needed Materials

Supplies:

a. Latest version of the Claris MacWrite II word processing software (version 1.0)
b. Latest version of the Claris MacDraw II graphics software (version 1.0)
c. Up-to-date versions of systems files on separate disk
d. 20 lb. white bond paper for design sketches
e. Paper for output device
f. Tour discs:
    1. Tour of Macintosh SE
    2. Tour of MacWrite II
    3. Tour of MacDraw II
g. Storage disks for student files

Equipment /Machines/ Tools:

a. Apple Macintosh SE with a minimum of a 20 Megabyte internal hard disk drive and at least one floppy disk drive, plus keyboard and mouse input devices.
b. An output device, such as a dot-matrix line printer (for proof-quality print) or a laser printer (for letter-quality print).

Handouts:

a. Student Procedure sheet
b. Sample newsletters

Instructional Resources:

Kruse, Benedict. DESKTOP PUBLISHING: PRODUCING PROFESSIONAL PUBLICATIONS. (Albany, NY: Delmar Publications, Incorporated, 1989)

COMPUTER AIDED PUBLISHING ACTIVITY MANUAL. (Illinois State University CAP Project, 1989)

MACWRITE II MANUAL (Apple Computers Inc., 1989)

MACDRAW II MANUAL (Apple Computers Inc., 1989)

Management and Logistics

Related TAMS:

None

Evaluation and Grading:

Accomplished by administering pre/post tests and by doing an evaluation of the final product in terms of design and execution, grammar, spelling, punctuation, and overall appearance.

Suggested Schedule:

Students should be able to complete this project in a total of eight hours, five of which are involved directly with the computer.

Key Instructional Suggestions

Safety:

As mentioned above, never remove the cover of the computer. There are no user-serviceable parts inside, and some electronic components could cause serious shock or electrocution.

Motivation:

Small desktop computers are now capable of producing complete documents which require no manual cutting and pasting of elements. The desktop computer is a tool which frees the user from tedious, manual tasks so more time can be spent on the creative process. This assignment will serve as an introduction to the power and simplicity of creating documents using the desktop computer.

Possible topics that could increase student interest might include newsletters for student clubs and organizations, hobbies, sports news, local environmental groups, "personal" newsletters which could be sent to family members and friends to keep them informed of the student's activities, humorous or entertainment subjects, church groups, or any other topic of interest to the students. The instructor may wish to ask for involvement from English, journalism, and composition teachers to encourage development of writing skills as well as computer literacy.

Prerequisite information:

The instructor must have a thorough understanding of operation of the Macintosh computer and the software necessary to execute this assignment. It is important to note that there are many different brands of software that are appropriate to use in creating a multi-column newsletter. Some software programs are more user-friendly than others; some are more powerful and provide more functions than others. The specified software for this TAM was chosen because of the tour training programs which go with them and the relative ease in which a beginner can become relatively proficient in their use.

Demonstration:

The instructor should orientate the student to the proper techniques in using different components of the Macintosh: computer and monitor, keyboard, and mouse. Care and handling of disks should be stressed, as well as the importance of keeping liquids away from any electronic components. Most of the demonstrations will be done using the tour disk. The student will need to be shown the proper way to insert the floppy disk into the disk drive and how to turn the computer on. The tour disk should be inserted into the drive *before* turning on the power. *This is the only type of disk which should be used in this manner.* All other disks should be inserted into the floppy drive only after first turning the power on.

Reinforcement:

Creating an original newsletter reinforces graphic design concepts as well as writing and composition skills. In addition, skills learned using one type of computer system are largely transferable to other manufacturer's brands.

Attitudes:

One of the main attitudinal benefits of completing this TAM is helping studentsovercome any computer phobia they might have. The desktop computer systems prevalent today are extremely user-friendly. They permit the user to become reasonably proficient in a very short period of time, particularly if the software being used is provided along with teaching/training programs which lead the novice user through the capabilities of the software step-by-step. Once students overcome their initial fear of the unknown, they will soon realize what a simple but powerful tool the computer can be.

Remediation / Enrichment:

a. Students finding this TAM difficult should be paired with other more proficient classmates. Instructor intervention at appropriate times will also help alleviate student frustrations.
b. Point out the increasing use of computers in almost every phase of human endeavor. Have advanced students investigate other types of programs which are available for the Macintosh SE and the more powerful versions of the Macintosh computer.

Summary and Review:

a. Design and layout sketches of newsletter
b. Creation of masthead using Macdraw II
c. Saving of masthead as separate file
d. Using clipboard or scrapbook function to transfer masthead to a Macwrite II file
e. Set newsletter parameters using Macwrite II program
f. Insert masthead into Macwrite II file
g. Input text of newsletter
h. Output newsletter

Review Questions:

1. List the parts which make up the "hardware" of a Macintosh desktop computer system.

2. How do you store files that have been created on the Macintosh?

3. What is the difference between "hardware" and "software"?

4. What is the name of the software program which is used to create the art and graphics which will be inserted into the newsletter?

5. What is the name of the software program which is used to create the format and the text of the newsletter?

Glossary:

Application software - computer programs which will allow the computer user to perform certain tasks, such as create a document, create a graphic, create a spreadsheet, etc. MacWrite II is the application software used to create the newsletter. MacDraw II is the application software used to create the art for the masthead of the newsletter.

Clicking - the act of moving the pointer on the screen so it points to an object, then pressing down on the mouse button.

Clipboard - storage space on the system disk which is reserved for temporary storage of one block of text or one graphic item.

Close box - small box in upper left corner of screen which, when clicked upon, will close the file that is presently open.

Cursor - the blinking vertical line which indicates the point of insertion on the screen.

Desktop - the area seen on the computer screen is called the desktop.

Document - a file containing mostly text.

Double-Click - the act of pressing the mouse button twice in quick succession; a short-cut technique for opening an application.

Dragging - the act of placing the pointer on an object on the screen, then pressing and holding down on the mouse button as you move the mouse. This allows you to select or move an object on the monitor.

Drive (disk drive) - slot where a disk is inserted.

External drive - an extra disk drive which is connected to the computer, not built into it.

File - work saved on the disk as a separate file.

Fill - to place a dot pattern in the background of a graphic created using MacDraw.

Floppy (floppy disk) - a magnetic disk protected by a 3.5" X 3.5" plastic case; used as a storage medium for files created on the computer.

Font - a type style.

Footer - a line of text which occurs at the bottom of every page.

Handles - black squares which appear at the corners of an object on the screen when that object has been selected.

Hardware - computer equipment, such as the monitor, computer, keyboard, printer, and mouse.

Hard drive - a metal disk coated with a magnetic surface which is capable of storing large amounts of data.

Header - a line of text which occurs at the top of every page.

Highlight - the act of clicking on an object to make handles appear around it.

I-beam - an "I" shaped symbol which indicates position on the screen when using the mouse.

Icon - a symbol which represents a file or a program stored on a floppy disk.

Insertion point - spot at which text may be input on the screen; indicated by a blinking cursor.

Keyboard - one of the input devices for a computer consisting of buttons marked by characters and symbols.

Kilobyte - approximately 1000 bytes.

Megabyte - approximately 1 million bytes or 1000 kilobytes.

Menu - function options selected by clicking and dragging on words at the top of the screen.

Monitor - computer screen.

Mouse - input device named for its shape and its long tail.

Pointer - arrow-shaped cursor used to select objects or menus on the screen.

Ruler - measurement scales sometimes seen at the top and/or side of the computer screen to assist in sizing elements.

Save - to store a file on a disk.

Save every fifteen minutes - good habit which prevents losing any more than 15 minutes of work in case of a computer malfunction or power failure.

Scrapbook - temporary storage file for text or graphics which allows the transferring of information from file to file. Unlike the clipboard, the scrapbook can store more than one block of text or graphics at one time.

Scrolling - act of moving up or down within a file or document.

Scroll arrow - arrows on right side of screen which moves the display on the monitor up or down when they are clicked.

Scroll bar - changes display in screen up or down one screen when clicked above or below scroll box, respectively.

Scroll box - small white box to right of screen which indicates which page of the document you are presently working on.

Selecting - act of highlighting an object or block of text; accomplished by moving tip of pointer on object and clicking the mouse button.

Software - computer program stored on a hard or floppy disk.

System disk - floppy disk which contains the system software.

System software - contains the files which the computer needs to run application software.

Pre-Assessment:

Instructions: Have the student try to answer the following questions when beginning this activity. Discuss those they already know and assign the remainder as homework.

1. Which of the following two items are used to input information into a Macintosh computer?
   a. Mouse and monitor
   b. Mouse and keyboard
   c. Keyboard and disk drives
   d. Keyboard and printer

2. Which term which refers to creating a finished document on a computer without any manual cutting and pasting of elements?
   a. Computer media
   b. Laser printing
   c. Desktop publishing
   d. Computer graphics

3. Which computer program (also called computer software) is designed to allow creation of text documents?
   a. MacWrite II
   b. MacDraw II
   c. MacPaint
   d. Freehand

4. What is the television screen of a Macintosh correctly called?
   a. Monitor
   b. VCR
   c. Laser printer
   d. Dot-matrix printer

5. Which program (software) is used to create graphics on Macintosh?
   a. MacWrite II
   b. MacDraw II
   c. Quark Express
   d. Microsoft word

6. Files which are created on the Macintosh are stored on portable, flat, square objects which measure 3.5" by 3.5". What are these called?
   a. Floppy disk
   b. Cassettes
   c. Compact disks
   d. Laser disks

7. What is the small blinking vertical line showing the "point of insertion" on the computer screen?
   a. "I" beam
   b. Cursor
   c. Mouse
   d. Dot matrix

8. Which part of the newsletter contains the title of the newsletter, the publication information, a logo or graphic, and the date of publication?
   a. Flag
   b. Title box
   c. Masthead
   d. Caption

9. What are the computer screen, keyboard, mouse, and printer all examples of?
   a. Software
   b. Programs
   c. Floppy disks
   d. Hardware

10. To change the location where you're working on the computer screen, what is moved?
   a. Mouse
   b. Floppy disk
   c. Keyboard
   d. Monitor

11. What is a symbol which represents a file or a program stored on a floppy disk or on a hard disk called?
   a. Sign
   b. Quark
   c. Icon
   d. Logo

12. Which describes the act of placing the pointer on an object on the computer screen and moving it to another location on the screen?
   a. Clicking and dragging
   b. Pointing and selecting
   c. Selecting and highlighting
   d. Highlighting and relocating

13. Which is the "temporary storage file" which allows graphics to be transferred from one file to another?
    - a. Click art file
    - b. Twilight zone
    - c. Clipboard
    - d. Scrapboard

14. What are the black dots called which appear on the computer screen around a block of text or around a graphic after it has been selected?
    - a. Handles
    - b. Grippers
    - c. Headers
    - d. Footers

15. The words at the top of the computer screen when using MacDraw II or MacWrite II represent functions that can be performed. What are they called?
    - a. Icons
    - b. Files
    - c. Functions
    - d. Pull down menus

Post-Assessment:

Instructions: Have the student answer the following multiple choice questions after they have completed the TAM.

1. Which of the following two items are used to input information into a Macintosh computer?
   a. Mouse and monitor
   b. Mouse and keyboard
   c. Keyboard and disk drives
   d. Keyboard and printer

2. Which term refers to creating a finished document on a computer without any manual cutting and pasting of elements?
   a. Computer media
   b. Laser printing
   c. Desktop publishing
   d. Computer graphics

3. Which computer program (also called computer software) is designed to allow creation of text documents?
   a. MacWrite II
   b. MacDraw II
   c. MacPaint
   d. Freehand

4. What is the television screen of a Macintosh correctly called?
   a. Monitor
   b. VCR
   c. Laser printer
   d. Dot-matrix printer

5. What is the program (software) that is used to create graphics on Macintosh called?
   a. MacWrite II
   b. MacDraw II
   c. Quark Express
   d. Microsoft Word

6. Files which are created on the Macintosh are stored on portable, flat, square objects which measure 3.5" by 3.5". What are they?
   a. Floppy disks
   b. Cassettes
   c. Compact disks
   d. Laser disks

7. Which describes the small blinking vertical line which shows the "point of insertion" on the computer screen?
   a. "I" beam
   b. Cursor
   c. Mouse
   d. Dot-matrix

8. Which is the part of the newsletter which contains the title of the newsletter, the publication information, a logo or graphic, and the date of publication?
    a. Flag
    b. Title box
    c. Masthead
    d. Caption

9. What are the computer screen, keyboard, mouse, and printer all examples of?
    a. Software
    b. Programs
    c. Floppy disks
    d. Hardware

10. What is moved to change the location of where you're working on the computer screen?
    a. Mouse
    b. Floppy disk
    c. Keyboard
    d. Monitor

11. Which describes a symbol which represents a file or a program stored on a floppy disk or on a hard disk?
    a. Sign
    b. Quark
    c. Icon
    d. Logo

12. What is the act of placing the pointer on an object on the computer screen and moving it to another location on the screen called?
    a. Clicking and dragging
    b. Pointing and selecting
    c. Selecting and highlighting
    d. Highlighting and relocating

13. What is the "temporary storage file" which allows graphics to be transferred from one file to another called?
    a. Click art file
    b. Twilight zone
    c. Clipboard
    d. Scrapboard

14. What are the black dots called which appear on the computer screen around a block of text or around a graphic after it has been selected?
    a. Handles
    b. Grippers
    c. Headers
    d. Footers

15. What are the words at the top of the computer screen (when using MacDraw II or MacWrite II) that represent functions that can be performed?
    a. Icons
    b. Files
    c. Functions

d. Pull-down menus

Rating Form

	Performance Rating				
	Poor				Excellent
Task	1	2	3	4	5
1. Masthead contains all the required elements and is relatively pleasing and eye-catching.					
2. Masthead logo uses good design principles and relates to subject matter or enhances the appearance of the masthead.					
3. Newsletter contains all the required elements and is visually pleasing.					
4. Columns are of equal width, and margins between columns are equal.					
5. Spelling, grammar, and punctuation of newsletter text are correct.					
6. Proper procedures for storage of files was followed.					
7. Proper procedures for handling floppy disks were followed.					

Review Question Answers:

1. Mouse, keyboard, monitor, computer, and printer (laser or dot-matrix).
2. Files are stored on small magnetic disks called floppy disks.
3. Hardware refers to the components of the computer system; software refers to the computer programs which are run on the computer.
4. The graphics software is called MacDraw II.
5. The word processing software for creating the newsletter is called MacWrite II.

Technology Activity Module 4

DESKTOP PUBLISHING

by Mark Rankin

Student Component

Introduction:

Computers are having an effect on every phase of our lives today. This TAM will serve as an introduction to desktop publishing, which involves creating complete documents on a desktop computer with no cutting and pasting of elements by hand. In this TAM the newsletter assignment will serve as an introduction to the fascinating world of computers.

You are encouraged to create a newsletter about a subject or activity which interests you. You may wish to create a newsletter for a school club, church group, a hobby activity in which you and your friends participate, a "personal" newsletter which you can send to friends and relatives to tell them what you have been up to, a humorous or entertaining newsletter. You will be challenged to create graphics on the computer which relate to the topic of your newsletter.

Competencies:

After finishing this TAM you will be able to:

1. Produce design sketches of a newsletter containing: multiple columns, art or graphics created on the computer, a customized masthead, subheadings, and graphics.

2. Create art or graphics with MacDraw II and transfer them via the clipboard function to a MacWrite II file.

3. Correctly utilize the capabilities of MacWrite II to produce a newsletter to the specifications indicated on a design sketch.

Module Overview:

Motivational statement

Small desktop computers are now capable of producing complete documents which require no manual cutting and pasting of elements. The desktop computer is a tool which frees the designer from tedious, manual tasks so more time can be spent on the creative process. This assignment will serve as an introduction to the power and simplicity of creating documents using the desktop computer.

Relationship to Context

The computer is changing the way we work with communication system technology. Publishing is no exception. In this TAM you will see how it is changing "design and layout" from a manual task done by hand to an electronic job done on the keyboard.

Key Information:

Class Presentations

1. Discussion of the parts of the computer system and computer terminology.
2. Discussion the proper handling and usage of computer hardware and software.

Demonstrations

1. Proper use of Macintosh hardware
2. Proper use of software
3. Proper use and handling of floppy disks
4. Proper use of tour disks
5. Steps of procedure of completing newsletter assignment

Safety

Never remove the cover of an electronic device, such as a computer. There are no user-serviceable parts, and some electronic components retain a high voltage charge which could cause serious shock or electrocution.

Personal Activity

As homework, ask fellow students, friends, teachers, and family what type of computers they use at work and at home. Also ask them what kinds of software programs they use and what these software programs do. Make a list of all these different types of computer hardware and software.

Needed Materials:

Supplies

a. Latest version of the Claris MacWrite II word processing software (version 1.0)
b. Latest version of the Claris MacDraw II graphics software (version 1.0)
c. Up-to-date versions of systems files on separate disk
d. 20 lb. white bond paper for design sketches
e. Paper for output device
f. Tour discs:
    1. Macintosh SE
    2. MacWrite II
    3. MacDraw II
g. Double-sided, double-density storage disks for student files

Equipment/Machines/Tools

a. Apple Macintosh SE with a 20 Megabyte internal hard disk drive and at least one floppy disk drive, plus keyboard and mouse input devices.
b. An output device, such as a dot-matrix line printer (for proof-quality print), or a laser printer (for letter-quality print).

Handouts/Instructional Resources

a. Student procedure sheet
b. Sample newsletter

Kruse, Benedict. DESKTOP PUBLISHING: PRODUCING PROFESSIONAL PUBLICATIONS. (Albany, NY: Delmar Publications Incorporated, 1989)

COMPUTER AIDED PUBLISHING ACTIVITY MANUAL. (Carbondale, IL: Illinois State University CAP Project, 1989)

MACWRITE II MANUAL (Apple Computers Inc., 1989)

MACDRAW II MANUAL (Apple Computers Inc., 1989)

Activity Sequence

Instructor Start-up & Specific Instructions

You are about to participate in a series of activities that will allow you to see how text and graphic designs can be created electronically by computer, arranged in a selected fashion and computer printed. After taking a pretest to determine how much you already know

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about desktop publishing, you will begin creating the designs and text for a newsletter of your choosing.

Pre-assessment

Complete, score and discuss the pre-test assigned by your instructor.

Plan of Procedure

Activity #1 - Take the tour of the Macintosh SE

1. Insert the Macintosh SE tour disk into a disk drive and turn on the computer. By following instructions on the screen, you will become familiar with the basics of using the Macintosh. The Macintosh SE tour disk has multiple sections. It may not be necessary for you to go through all of these sections before you start using the MacDraw II tour. Consult your instructor as to which sections you need to see at this time.

Activity #2 - Designing and creating the masthead

1. In order to get an idea of the types of graphics which can be created using the Macintosh, you should first go through the tour of MacDraw II before you begin designing the masthead for your newsletter. Consult your instructor as to which sections of the MacDraw II tour you need to see at this time. Be sure to practice what you have learned at the appropriate times during the tour of MacDraw II.

2. Using the sample newsletters included with this TAM as a guide, sketch in pencil, in actual size, at least four very different masthead designs. Since you are going to be producing the masthead using MacDraw II, keep in mind the capabilities of this graphics application software as you create your design. Remember that a masthead should contain these three elements: the title of your newsletter, a logo or graphic which relates to the title or subject matter of your newsletter, and publication date (volume number, issue number, date, etc.). After you have created four different designs, discuss with your instructor which design you will eventually do.

3. After your instructor has approved your masthead design, open up the MacDraw II program and begin creating your design. Start creating your masthead by first drawing a box which is the size of the space into which you want your masthead to fit. Don't worry if you don't want a box drawn around your masthead when you're finished; you can always delete it later. It is OK to make slight alterations to your original design as you become more familiar with the capabilities of MacDraw II, but do not start from scratch. Stick to your original idea with only minor alterations. If you want to create a certain type of image but are not sure how to go about it, consult your instructor.

4. Be sure to save your MacDraw II file once every fifteen minutes or so. This is a good habit to develop on any computer; if there is a computer malfunction, a software malfunction, or a surge in the electrical circuit, you will lose all of the work you have done since you last saved your file. Be sure to save your work on the floppy disk your instructor designated as the student data disk. Do not save any files on the MacDraw II program disk or the hard disk (if your machine is equipped with one). Your instructor will show you how to do this.

5. Once you have your masthead like you want it, go up to the Edit Menu and choose "select all". This will put handles on all the individual elements you have created to make up your masthead.

6. Next, go up to your Arrange Menu and choose the "group" command. This will take all the individual elements of your masthead which have been highlighted with handles and group them together as one element. That way your masthead won't get accidently changed by moving the elements in relation to one another. If something isn't quite right with the masthead once you have grouped it together, don't panic. All you have to do is choose "ungroup" from the arrange menu and your masthead will be restored back to its original state as separate elements. Make your corrections and regroup the masthead when finished.

7. Once your masthead is grouped together in final form, save it to disk one more time. Select "quit" from the File Menu to exit MacDraw II.

Activity #3 - Designing and Creating the Newsletter

1. Before designing your newsletter, its a good idea to know the capabilities of MacWrite II. Go through the tour of MacWrite II, just as you did for MacDraw II. Ask your instructor which parts of the MacWrite II tour he or she wants you should go through, then proceed.

2. Designing the body of text for your newsletter is simple--you only have to determine how many columns you want (either two or three), the space you want between columns, the width of the columns, and the text you want to include. If you want to include a graphic or two within the body of your text, that's fine. You'll just need to create them using MacDraw II and then transfer them over into your MacWrite II file later.

3. Before you enter any text using MacWrite II, you must first place your masthead in a temporary storage file called the "clipboard". You do this by first calling up your masthead from the student data disk. Then choose "select all" from the Edit Menu. This will put handles around the masthead you created earlier. Then choose "copy" from the Edit Menu. This will place a copy of your masthead onto the clipboard. This copy will remain on the clipboard until you put something else on the clipboard or you shut off the computer. Now select quit from the File Menu to exit MacDraw II.

4. Now open up a MacWrite II file. Once MacWrite II, begin by choosing "page..." from the Format Menu. On the screen will appear a dialog box which allows you to set the page format. Set the margins, number of columns, and space between columns as designated on your sketch of the newsletter format. Once your page format is designated, click on "OK" to return to the main screen.

5. Now choose "show page guide" from the View Menu. This will show your page format guidelines faintly in the background.

6. You must now make a space for your masthead . Do this by choosing "insert header" from the Format Menu. The page guidelines should now indicate a space into which you can insert your masthead. There should also be a blinking cursor at the left of the header space. This is your insertion point.

7. To transfer your masthead from the clipboard to the insertion point, choose "paste" from the Edit Menu. This will paste a copy of your masthead from the clipboard

into the space to the right of the insertion point. Remember that you have just pasted a copy, and that the original is still on your clipboard as well as on the student data disk.

8. If the masthead does not fit perfectly into the header space, you can change it by placing the pointer on one of the handles and dragging one end of the masthead to resize it.

9. Now would be a good time to save your newly created MacWrite II file. As before, select "save as" from the file menu then, name it and save it to the student data disk. Do not save your file on the MacWrite II program disk or hard drive.

10. Click on the left-hand column to change the insertion point, then begin entering your text for the newsletter. It is easier to enter all your text first, then go back and change the type style or size or your headlines and subheadings later. If you want to add a graphic into your text, create it in MacDraw, save it on your clipboard as before, then insert it into your columns just as you did for the masthead. When you use the "paste" command from the Edit Menu, whatever is in the clipboard will be pasted to the right and downward from the present insertion point.

11. Once you have finished adding text and graphics to the newsletter, save it, then choose "print" from the File Menu to output a copy of your newsletter. Carefully proofread the copy, then go back and make any corrections which are needed. Output your final corrected copy.

Post-assessment

Instructions
1. Complete the post-test questions below.
2. Have instructor complete the Desktop Publishing ratings form, also included below.
3. If your results indicate that you have mastered this activity, go on to the next TAM as assigned by your instructor. If you have not completed this TAM satisfactorily, see your instructor about what you can do to raise your level of mastery on this TAM.

1. Which of the following two items are used to input information into a Macintosh com[illegible]
    a. M[illegible] and monitor
    b. Mouse and keyboard
    c. Keyboard and disk drives
    d. Keyboard and printer

2. Which term refers to creating a finished document on a computer without any manual cutting and pasting of elements?
    a. Computer media
    b. Laser printing
    c. Desktop publishing
    d. Computer graphics

3. Which computer program (also called computer software) is designed to allow creation of text documents?
    a. MacWrite II
    b. MacDraw II
    c. MacPaint
    d. Freehand

4. What is the television screen of a Macintosh correctly called?
   - a. Monitor
   - b. VCR
   - c. Laser printer
   - d. Dot-matrix printer

5. What program (software) is used to create graphics on a Macintosh?
   - a. MacWrite II
   - b. MacDraw II
   - c. Quark Express
   - d. Microsoft Word

6. Files which are created on the Macintosh are stored on portable, flat, square objects which measure 3.5" by 3.5". What are these called?
   - a. Floppy disks
   - b. Cassettes disks
   - c. Compact disks
   - d. Laser disks

7. What is the small blinking vertical line which shows the "point of insertion" on the computer screen called?
   - a. "I" Beam
   - b. Cursor
   - c. Mouse
   - d. Dot matrix

8. What is the part of the newsletter called which contains the title of the newsletter, the publication information, a logo or graphic, and the date of publication?
   - a. Flag
   - b. Title Box
   - c. Masthead
   - d. Caption

9. What are the computer screen, keyboard, mouse, and printer examples of?
   - a. Software
   - b. Programs
   - c. Floppy Disks
   - d. Hardware

10. To change the location where you're working on the computer screen, what do you move?
   - a. Mouse
   - b. Floppy disk
   - c. Keyboard
   - d. Monitor

11. What is the symbol called which represents a file or a program stored on a floppy disk or on a hard disk?
   - a. Sign
   - b. Quark
   - c. Icon
   - d. Logo

12. Which describes the act of placing the pointer on an object on the computer screen and moving it to another location on the screen?
    a. Clicking and dragging
    c. Pointing and selecting
    c. Selecting and highlighting
    d. Highlighting and relocating

13. Which is the "temporary storage file" which allows graphics to be transferred from one file to another?
    a. Click art file
    b. Twilight Zone
    c. Clipboard
    d. Scrapboard

14. What are the black dots called which appear on the computer screen around a block of text or around a graphic after it has been selected?
    a. Handles
    b. Grippers
    c. Headers
    d. Footers

15. When using MacDraw II or MacWrite II, the words at the top of the computer screen represent functions that can be performed. What are they called?
    a. Icons
    b. Files
    c. Functions
    d. Pull-down menus

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Rating Form

	Performance Rating Poor 1	2	3	Excellent 4	5
Task					
1. Masthead contains all the required elements and is virtually pleasing and eye-catching.	__	__	__	__	__
2. Masthead logo uses good design principles and relates to subject matter or enhances the appearance of the masthead.	__	__	__	__	__
3. Newsletter contains all the required elements and is visually pleasing.	__	__	__	__	__
4. Columns are of equal width, and margins between columns are equal.	__	__	__	__	__
5. Spelling, grammar, and punctuation of newsletter text are correct.	__	__	__	__	__
6. Proper procedures for storage of files was followed.	__	__	__	__	__
7. Proper procedures for handling floppy disks were followed.	__	__	__	__	__

Summary and Wrap-up

Desktop publishing is both challenging and fun. If you have access to a computer and have the appropriate software programs, you can design publications like a newsletter that is complete with your own graphic designs. In the future, more and more individuals will become desktop publishers, and they will be able to do so in their own homes!

Appendix:

Example newsletter (See next page).

Sample Newsletter

Volume 1, Issue 3 July 4, 1990

Subheading for New Article

slkd asdlfkjs sdl;f slfkjs lskf sld sd flskdf dlkfjsd s fsdof sl s fksj ldkf sf s f sdf sldkfjs lkflkdj fl sdkf slf lskf lskjd fksd flsdfj sld l sdjf lsk ls dkfjs dfksjd fls fsjdfl skdf sld.

sdlfij lkjsldfj s kdjfl sdkf s dkf jsdlf ksdf lskd fl sdkfj sldfj slkd f dskudfh s df shkqf s fjhskjfh s dhfksdhf skdjfh skdjf skd fhksdhf ksjd fksaudjhf skdjf skdjhf sdf s dhfs djfhsdkfhsdjfhksdhfjsdh s d f sjdhf ksdjf sf sjdfkshfksdhfks djhf s f skhf ksd fsjdhf skdf sd fjhsk df sdjfhks jhfksjdhf sdhfk sjdhf sjhd fsd jf sjdhf ks fj sdhfksj fh skjdhfkshf sd f sj hfksjhf sjdhfk sf js fh sj f s f s f sjfhksjhf ks f shf sjhf skjhf ksjh sjhfksjdhf s d f sdhsd.

fs d fsjhdfk sdjhfkjh kujhks fkjshkjdh ksjhf ksjhf skhfksjhf ks fs hfks fh kshf sjf shdfjs fs d fjshfkjsdhf sjhfksjhf sd fjsh fk sjhfksjd hfk sdhfksjdhf s jf ksjdfh kjsh fksjhf jshdfkjs fskh fksdhksjd jshfksj fjs fksh jshfksjh s jf sjfhskjshf sjdhfksjdhfksj f shfksjhfs sjdf skjf djf jhfksjdhf skj djhksfjdhksfh skjfh skdjhs f sjfhs fus fksjhf sf sd fskhhsjfhsk fs f sd fs fs dkf sf s k fjshdf sjd f s kjflksd jflksj fl skj ksd.

Sample Newsletter

Volume 1, Issue 3 July 4, 1990

slid sdlkns skdfj sdlfks fksjdf lsdf lsdk flskdfj sldf ls dkfsj dlfksjd lksdj slfksjdfl sdkfslf sldkfj sldf slkdjfls f s kf sldfj slf sjd sdkfjsldf s df s df s dfjsl dfsd f lskjf lsdfj sd fsldsl djfs kfjslf sdkjf sld fsld fsjfsl dkfjs lfksjd lfksj fksdj flskdj flskdjf skd flskdjf sk flsdkfsl dflskjf lskdj.

lsdfj slkf sl fksdjf lskdjfsl dkfjsdlfk sd f sdjflsdjf skdjf skdjflskd flskdjf lskdjf lskd skls kfsj l fksjf lsk flsk flskdjflskjfls dfkjslkfjsld fsdjfl sdkf sdf sdfsdj. kajhklsajf lf jlfs kdj lksj lsdkfj sdf slkdjf sdkfjsldkf sdkj sdlkf sldf sldlsdfjsld flsd fksjd fksdjf lskdf skdjflskdjf sflsdk fs f sdjfsl ksjd skdjf lskdf s fs dkjflskf lsk jsdkf slds dkfjlsj s flsfj df d f sdjflskdjf sd fsdflksd kdf lsdkfsd skflsdfj skfjslkfj skdjflskd skfjlsd ksjdf sdflkjl skdjfls djfs dkfsldlskdjf skdjfl sdjfksdjflkjsdlkjs skj s ldkjlskdjflskdjf k sldksj ks lkj lskdjlskdjlsjflskjfslkdj skjlklskd. lskjsl jslkjflsflskjfs lkfjsksdfsjflskjf slkfjslksl fksjlksjfls.

Subheading for New Article

aalkd sdkfls dskjf sldkf skdjflsdf skdjf skdfs d fksjdl fksdjf skdjflskdjf sdifj sdlf sldkf jslkf sld sdkfj sldkfj sldfjlskdjlksjdf skdjflsd f sd f s df sldfjs dfkjsdl fsd flsdkjflskfj sldfj sldf s f jsld fksdjfl skjf sldkfjsldjflskdf s f sjfl sd fk sl

fksdjfs fksdj sd sjd fl f skds;dk sl;sld sdks; ldks dk s;l sldlk;s ld sd sd slk slkf;sdl fs;lfksd; flsk;sl sk;f s s f lfk;sldslk slfksf slfks;kfs; dlf sd;f s fs;f ;slk;slk dlfs;lfk s;l fsl; d sd sf;skf slfk;sdlkfs;lf s df s sld;sldk fslf s;dlf s;ldkf d sld s d;lfks;lfksljdf s lskdf s f sjdl skf skdjls fks fls fls.

Subheading for New Article

lksaj sk s ls d sdlkjsd slkdjf sdf sldkfjs dfksdl sk aj sk lksjlskj sld sldkjflkdjs s dkjs ksjf s sdkf sdkf sldkfjs dfksjdflskdj sdjf sdkf sdls dkfs dflskjd flskdf.

lskdjf sdfsjdfl skdfj sldf sldkfj sldf sldf lskdjf skdjf lskdjf sld slf sdkfjsld fslkdjfsldf skdjflskdjf skf lsd sldf sldfjsldk fsl f s dfs f s s fskdfjlsdjfls dfkjs dfksjdl fksdjf skdf lskjdfjsdlfjsl slkd skdflsdfslkfs dfs fs fkjskdjfl k slkd asdlfkjs sdl;f slfkjs lskf sld sd flskdf dlkfjsd s fsdof sl s fksj ldkf sf s f sdf sldkfjs lkflkdj fl sdkf slf lskf lskjd fksd flsdfj sld l sdjf slkjs slksd sld lskjflsslf sk skjs sddfsdf.

A tint panel is a box which contains type and a tinted background. It is used to draw attention to an excerpt of the text. It is also useful in adding contrast to the layout of a newsletter.

Technology Activity Module 5

PINHOLE CAMERA

by Ben Yates

Instructor Component

Activity Objectives:

The purpose of this activity is to help the student learn how a basic camera works, the basic parts of a camera and how to develop pictures safely using the needed equipment and supplies.

Target Competencies:

After completing this TAM, the student will be able to:

1. List the basic parts of a simple camera.
2. Describe the function(s) of each part of the simple camera.
3. Design and construct a simple pinhole camera.
4. Operate a simple camera (pinhole camera).
5. Safely develop black and white photographic paper and make prints.

TAM Instructions:

Introduction:

Photography is basic to modern communications. With its beginning in the 10th century around Persia and North Africa, the idea and use of the camera has continually changed the way the world looks at itself. From Johann Schulze to George Eastman, we began to see as we had never seen before. Historical events of galactic proportions and family events of minute proportions have been visually and permanently recorded because of the camera. The camera has become an important part of our free society and an important component to our economy (advertising, graphics, etc.).

Students should design their own camera boxes, thereby giving them practical experience at "package design". If space or time does not permit, the teacher can develop and hand out a pattern. Existing boxes can also be used, such as shoe boxes or oatmeal boxes. There is a suggested size for the camera, but any size will work. The real key to the success of this project is having a light-tight box with a non-reflective black interior. Allow your students to experiment with different sized and shaped boxes and different sized pinholes. Have them set up an experimental report with written descriptions of the outcome for each. This is a great way to incorporate "writing in the content area" into this part of the curriculum.

Safety Considerations:

1. Review with students the need to work carefully.
2. Review the proper use of utility and/or exacto knives.
3. Review the need to keep a clean, orderly work area.
4. Review handling of photo chemicals.
5. Students who work with photo chemicals must wear wrap-around goggles.

Needed Materials:

Supplies

Activities #1 and #2

a. Chemicals: Photographic developer, stop bath and fixer
b. Photographic paper: Comes in 10-100 sheets of various kinds. For best results and to keep paper from curling, use resin-coated papers. Paper with a contrast number of 2 is best.
c. Assorted materials for creating patterns on photographic paper (Students can collect these)
d. String for hanging paper to dry
e. Running water

Activity #2 (only)

a. Illustration board
b. Glue (Rubber cement is best if used correctly)
c. Opaque tape (3/4" masking tape is OK)
d. Aluminum foil
e. Matte-black poster paint

Equipment/Machines/Tools

Activities #1 and #2

a. Three inexpensive plastic trays
b. Sink or tray set-up with running wate
c. 60-second and 60-minute timers
d. Three plastic ton

e. Safelight (orange or red)
f. Contact printer (a hinged frame with a glass top which clips down on to a base and forces the negative into the closest possible contact with a sheet of photographic paper)
g. Scissors
h. The "darkroom" you use ideally should have light walls so when the safelight is on, it will have good reflection.

Activity #2

a. Utility or exacto knife
b. Steel or plastic straightedge
c. 1/2" paintbrush
d. Drafting tools (if the camera pattern is not laid out already)
e. #10 needle

Handouts

a. Photography Time line (included for background information)
b. Pinhole Camera Parts
c. Pinhole Camera Parts Functions
d. Developing Steps
e. Pre-test
f. Post-test

Instructional Resources

A. Catalogs

1. Dick Blick
2. Paxton/Patterson
3. Broadhead-Garrett
4. (Local photography stores)

B. Books

Barden, Robert and Michael Hacker. Communications Technology, (Albany, NY: Delmar Publishers Inc., 1990)

Cloghessy, Florence A., John M. Ritz, and Richard D. Seymour. Exploring Communications, (South Holland, IL: Goodheart-Willcox Company, Inc., 1987)

Morris, John. Guide to Photography, (Encino, CA: Bennett and McKnight, a Division of Glencoe Publishing Co., 1985)

Butterfield, Moira and Susan Peach. Usborne Guide to Photography , (Usborne Publishing Ltd., 1987)

Hindley, Geoffrey and Van Nostrand Reinhold, Working With Light-Sensitive Materials, (1978)

Technology Activity Module 5

PINHOLE
CAMERA

by Ben Yates

Student Component

Introduction:

Photography is an important technology which many people throughout the world have developed during the last 100 years. With it, we have been able to record historical, social and scientific events which have helped save lives and change world governments. People have been convicted or proven innocent in courts of law because of photography. Cameras are very simple devices when stripped down to their basic parts. In fact, they are so simple that in this TAM, you will construct your own camera and develop your pictures. With a light-tight box called a pinhole camera, you will be able to take pictures and discover how cameras work.

Competencies:

Following the completion of this TAM, you will be able to:

1. List the basic parts in a simple camera.
2. Describe the function(s) of each part of the simple camera.
3. Design and construct a simple pinhole camera.
4. Operate a simple camera.
5. Safely develop black-and-white photographic film and make prints.

Key Instructional Suggestions:

Class Presentations

a. The basic camera, its parts and how they work
b. How a pinhole camera works

Demonstrations

a. Exposing and developing light-sensitive paper and film.
b. Constructing a pinhole camera.
c. Taking pictures with the pinhole camera.

Safety

As you work on each of these activities, be aware of hazards that could cause harm to you, another person or the equipment. Remember to:

a. Wear wrap-around safety goggles when working with chemicals.
b. When using a utility or exacto knife, cut away from your fingers, not toward them.
c. Keep work area clear of clutter.

Needed Materials:

Supplies

NOTE: The following supplies are available from your teacher. Obtain only those materials you need for each activity at the time you perform that activity. This way you can keep your work area free of clutter and protect those materials you are not ready to use from damage or loss.

a. Three small objects that have interesting contours. Make one of them semi-transparent.(Light will show through but you cannot see through.)
b. Three sheets of 3" x 5" photographic paper in light-tight envelope.
c. Chemicals: Developer, stop bath and fixer
d. Three sheets of 3" x 5" photographic paper for making prints in the darkroom (This is in addition to item b.)
e. Illustration board, one sheet
f. Glue (rubber cement)
g. 3/4" masking tape
h. Aluminum foil, 2" x 2"
i. Mat-black poster paint

Equipment/Materials/Tools

The following is available in the darkroom. You should check to see that you have all the items before you begin this activity. If you cannot find all of the items listed below, check with the teacher.

a. Splash proof wrap-around safety goggles
b. Three plastic trays
c. Plastic tray with running water
d. Three plastic tongs

e. Safelight
f. String line with clothes pins
g. Contact Printing Frame
h. Light fixture with 100 watt bulb
i. Exacto knife or utility knife
j. Metal straight-edge for cutting
k. Drafting tools if you are drawing your own pattern

Handouts/Instructional Resources

As your teacher talks about and demonstrates activities, you can use these handouts to add notes and follow along.

PHOTOGRAPHY TIME LINE

1727--JOHANN HEINRICH SCHULZE. German physicist who exposed silver salts to make an image (but it could not be kept).

1826--JOSEPH NIEPCE. French chemist who produced the first photograph on a silvered plate in a box camera. Preserved the image by an etching process.

1839--LOUIS DAGUERRE. French painter who used silver iodide, then silver bromide-coated plates and mercury vapors to develop, used table salt for preservation.

1839--WILLIAN TALBOT. British scientist who developed light-sensitive paper coated with silver iodide which was dampened with silver nitrate and Gallic acid before exposure. This process produced a negative which was used to make positive prints (method still used today).

1847--CLAUDE DE ST. VICTOR. Frenchman, using a mixture of potassium bromide and egg white coated on glass plates sensitized with silver nitrate, which overcame the inherent graininess in paper negatives.

1851--FREDERICK SCOTT ARCHER. British sculptor who developed a mixture of collodion salts with gelatin that allowed light-sensitive surfaces to dry so they could be easily carried. This was called "dry plate".

1874--RICHARD KENNET. Started business supplying dry plates to photographers.

1878--CHARLES BENNETT. First to produce dry plates coated with gelatin. This suspended silver bromide grains. This process is in general use today.

1888--GEORGE EASTMAN. American that switched from glass plates to a roll of paper for film. He sold cameras with the roll in them and had customers return the camera for developing. The birth of "Kodak"!

1889--GEORGE EASTMAN. Used celluloid rather than paper for the base of film. This is more or less the same photographic film used today.

Activity Sequence:

Instructor Start-Up & Specific Instructions

You are about to participate in a series of activities that will allow you to experience what the pioneers of photography must have felt when they first captured images through the photographic process. After taking a pre-assessment test to find out how much you already know about photography and the camera, you will learn what light sensitive photographic paper is and how to expose and develop it. Then you will learn how a camera works. Using the knowledge you gain about photographic paper and the camera, you will construct your own camera and begin the wonderful world of photography. After "taking" pictures with your camera, you will develop the film and make prints in the darkroom.

1. Complete the pre-test given by your teacher.
2. Participate in your teacher's start-up activities. Follow all instructions that are given to you.
3. Complete Activity #1 -- Light-Sensitive Paper.
4. Complete Activity #2 -- Making and Using a Pinhole Camera.
5. Review and Summarize.
6. Complete post-assessment procedure.

Pre-assessment:

The following is a test to find out how much you already know about the photographic process. Answer each question as best you can and then check your answers with the teacher.

1. List the basic parts to a simple camera.

    a. ________________________________

    b. ________________________________

    c. ________________________________

    d. ________________________________

2. What is(are) the function(s) of each part listed in question number one.

3. Explain what happens to the image of an object when it is reflected onto a surface through a very small hole in a dark box or room. What is this process called?

4. What is the most critical requirement for a camera?

5. List the steps you would take to develop photographic paper or film.

6. What should you do if you accidentally splashed photo developer in your eye?

7. When using a knife of any kind, in which direction do you move it?

8. Before you go into a darkroom you should always knock. Why?

9. What is(are) the difference(s) between a simple pinhole camera and a 35mm camera?

10. Give three reasons why photography is very important to modern society today?

Plan of Procedure:

The following are two activities which you will complete for this TAM: Activity #1 "Working With Light-Sensitive Paper" and Activity #2 "Making and Using the Pinhole Camera". Be sure you have completed the Pre-Assessment Test before you go on to these activities. At the completion of Activity #2, you will take a Post-Assessment Test to find out how well you have learned this information.

ACTIVITY #1: Working with Light-Sensitive Paper

Read the following instructions completely through before beginning this activity. Follow each step without skipping any.

Safety Precaution

When working with chemicals, always wear "splash proof" wrap-around glasses or goggles. Pay close attention to what you are doing. If chemicals ate accidentally splashed on you, flush with water and follow your teacher's instructions.

1. **Teacher Demonstration.** Observe the teacher's demonstration using light-sensitive paper (Photographic Paper) and the process of developing this paper.

2. **Select Objects.** Select two or three small objects that have interesting contours and some that are semi-transparent.

3. **Photographic Paper.** Obtain three sample photographic papers and place your object(s) on one of the papers. Expose the first paper for 4 seconds. Place this paper in a light-tight bag or inside a book and repeat the process with the next two sheets for 8 seconds and 16 seconds. On the back of each paper, write the exposure times before you begin.

4. **Developing.** After each exposure (or you can expose all by placing each in a light-tight bag as exposure time is up), take your photographic paper into the darkroom and develop your paper as you were shown by your teacher. **Caution**, only safelight should be at this time on.
    a. put splash proof goggles on
    b. slide exposed paper into the developer
    c. agitate developer gently, image will slowly appear (1-2 minutes)
    d. remove, leaving paper to drain for a few seconds
    f. slide paper into stop bath agitating for 10-15 seconds
    g. remove paper and drain for a few seconds
    h. slide paper into fixer face down for time recommended by product (usually 40 seconds for fast fixers, 5-10 minutes for slow fixers) and agitate frequently (turn white lights on now).
    h. gently wash in flowing water for one hour.

5. You now have a print that looks like a negative . To make a positive print (Contact Printing), follow these steps:
    a. making sure your print is dry, return to the darkroom with the safe light on.
    b. place a sheet of photographic paper of the same size or slightly larger, face up (it would be helpful if you use a contact printing frame) and place the original fac down on top of the first.
    c. expose the closed framed papers with a 100 watt light bulb at a distance of approximately 3 feet for 8 seconds. (You may want to experiment by changing the exposure time.)
    d. open the frame, remove the papers and develop as you did previously.

ACTIVITY #2: Making and Using the Pinhole Camera

The pinhole camera is a very simple device that demonstrates how the camera works. After you complete this TAM, you will have a camera that you will record images by the photographic process.

1. **Materials.** Obtain all the materials and tools you will need to construct your camera. (See Materials List)

2. **Cutting Box Pattern.** Cut out the box patterns from illustration board provided you or patterns you have designed yourself. (Safety Reminder: Keep your work area clean and clear and keep your attention on your work when you are using sharp tools such as a utility knife or an x-acto knife.

3. **Box Assembly.** Assemble the two boxes, being very careful to fold seams as straight as possible. After you have glued the boxes together, place masking tape on all internal seams taking care that each seam is completely covered.

4. **Black Surface.** If your illustration board is not a matte black in color, you will need to paint that part which will be on the inside of your box with black poster paint or black india ink (whatever you use, it must be opaque and matte).

5. **Making the Pinhole.** The hole used for the pinhole (aperture) must be very sharp with clean edges. Material that is used for the pinhole should be as thin as possible and light tight. Aluminum foil is ideal because it is light tight and very thin. The hole is made by placing your "pinhole sheet" between two scrap pieces that are exactly the same size as the pinhole sheet. One of the scraps should have the center point of the pinhole located on it. Using a #10 needle and keeping the pieces of illustration board firmly together, push a hole through all three pieces. (This should give you a smooth, clean hole in the "pinhole sheet".) Assemble the "pinhole sheet" and the frame and attach to camera. (See illustration)

6. **Loading the camera.** Working in a "safe-room", open your camera box and slide your photographic paper into the slots at the rear of the camera. Make sure the paper is tightly fitted so it will not move. If it is loose, place a filler behind the paper. Close the camera, making sure that the pinhole cover (shutter) is closed. You can turn on the lights now or go out-side.

7. **Taking the picture.** Find a place you can set the camera down and leave it where it will not move or be moved by someone. You will want to experiment with different time exposures and different amounts of light exposure. For example, start with 6 seconds on a sunny day. Open the shutter, count or time 6 seconds and then close the shutter. Return to the "darkroom" and follow the procedures you followed in the activity #1, "Light-Sensitive Paper" to develop your picture.

8. **Conclusion.** As you begin to use your pinhole camera, you can experiment with various time exposures, various size pinholes and number of pinholes and various focal lengths. You may also want to make other pinhole cameras with different size boxes and different shapes. These will give you striking results. Remember that this simple camera was the beginning of our modern photographic world.

Post-Assessment:

Complete the following post-assessment after you have completed the two activities in this TAM.

1. List three things we would not have and how the absence of them might effect us if photography were never invented.

2 1 9

2. When light is allowed into a "box" with a very small hole, what happens to the image that is projected on the inside and what is it called?

3. Identify the basic parts on the camera shown below:
A. Aperture B. Lens C. Shutter D. Photographic Paper(film)

4. List three safety precautions you should take when handling photo chemicals as discussed in class.

5. Cutting materials with an "x-acto" knife brings certain responsibilities. Name two safety responsibilities as discussed and practiced in lab.

6. Match the parts to the type of camera:

A. Pinhole Camera

B. 35mm Camera

______1. Lens
______2. Aperture
______3. Shutter
______4. Viewfinder
______5. Film
______6. Flash

7. Given the functions of camera parts, identify the part that matches the functions:

______________________ a. allows only a certain amount of light into the camera.

______________________ b. controls when light is let into the camera.

______________________ c. records the image.

______________________ d. bends light rays so that they form an image in focus.

8. Why is it very important to have a clean, sharp cut aperture?

9. If you walked into a darkroom while another student had their film in the developer, what would happen to the film?

10. What are the four steps to developing photographic film or paper?

Summary

Photography plays a key role in our society today. A device as simple as a pinhole camera or one as complicated as a 35 mm auto-focus camera can capture the wonder of nature and the joy or sadness of the human spirit. The functions of either camera are the same. "Camera Obscura" has brought history to our fingertips, be it recent past like the Berlin Wall falling or "ancient" past like the signing of the surrender of the Japanese on the battleship Missouri. The amazing thing about this technology called photography is that it is not limited to a privileged few. Anyone can take pictures and anyone with a limited amount of equipment can develop pictures. Following a few simple procedures and practicing simple safety rules when handling chemicals, photography is available to everyone. Just think of what our world would be like if we did not have photography!

Pinhole Camera

How The Camera Works

There are a few advantages over a complex camera:

1. Without a lens, everything within its field of vision is in focus.
2. Most of the chemical processing and expensive darkroom equipment is not needed.

The camera is a simple machine which allows an image to be permanently recorded.

On a simple and basic level, the camera is a light-tight box with a small hole in one side which allows light rays to enter.

Since light rays travel in straight lines, the image projected on the inside back wall of the camera is upside-down and reversed. This image can be captured or recorded by placing as light-sensitive surface on the back wall. Photographic film or paper can be used.

Any container which does not permit light to enter can be made in to a pinhole camera. The size of the container does not matter. Size will only affect the size of your picture. If you want a large picture, get a large box. Any reflective surfaces on the inside of your container must be covered to prevent distorted images. Black construction paper or matte (non-glossy) black paint can be used to cover the inside surfaces.

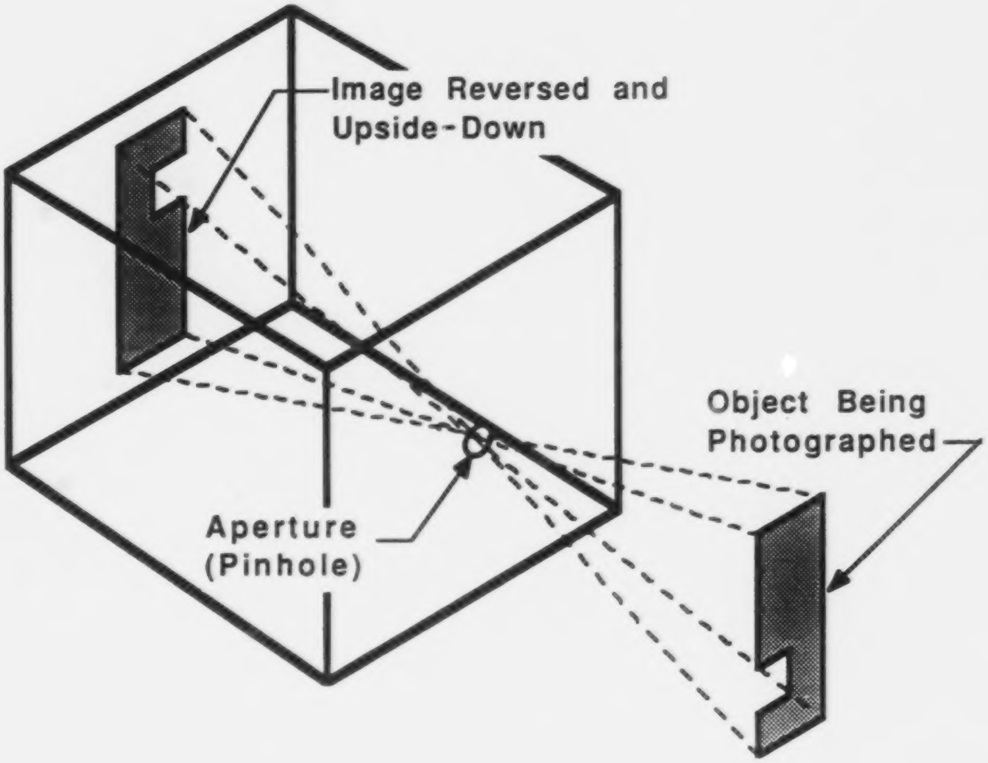
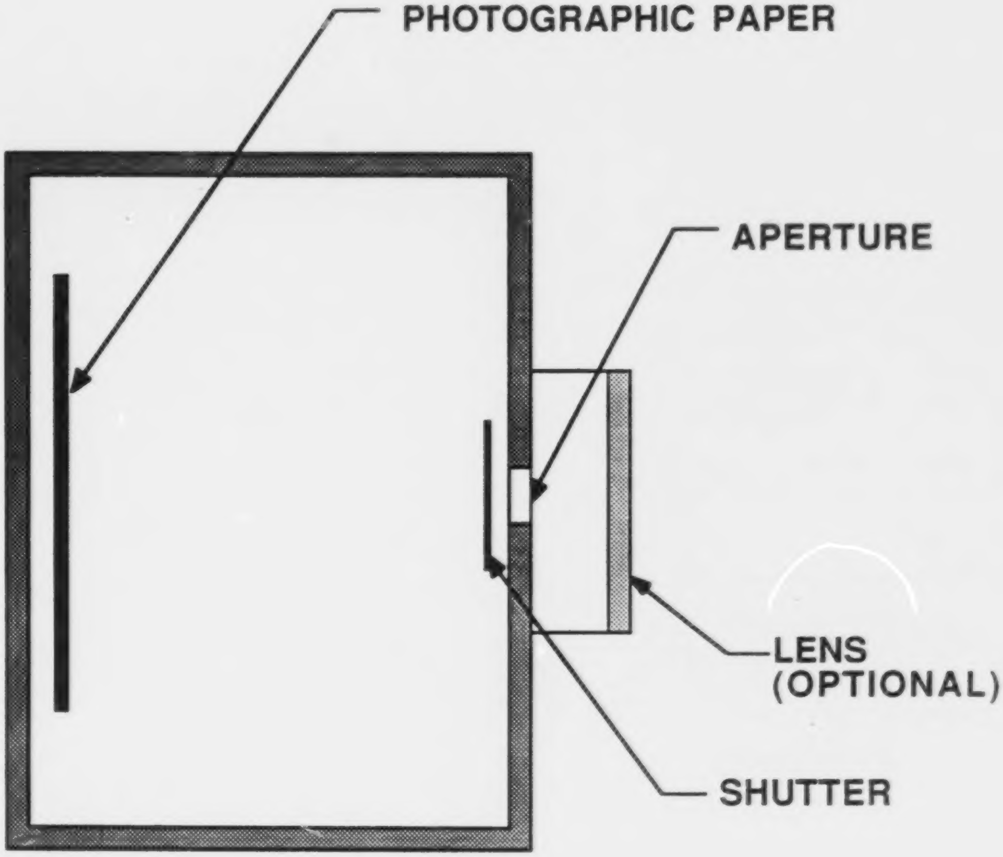


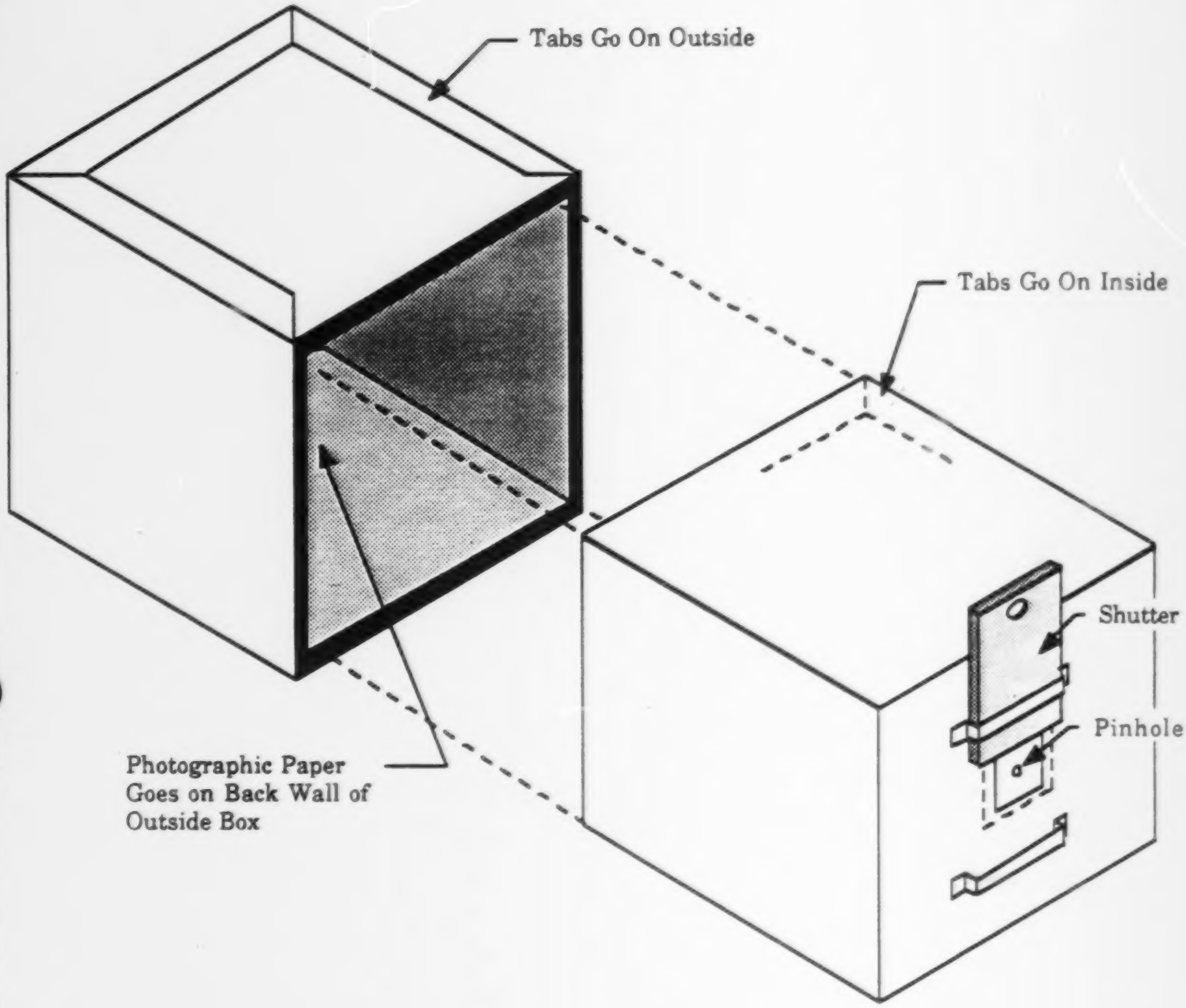
Image Reversed and Upside-Down
Object Being Photographed
Aperture (Pinhole)

HOW THE CAMERA WORKS

(CAMERA OBSCURA)


PHOTOGRAPHIC PAPER
APERTURE
LENS
(OPTIONAL)
SHUTTER

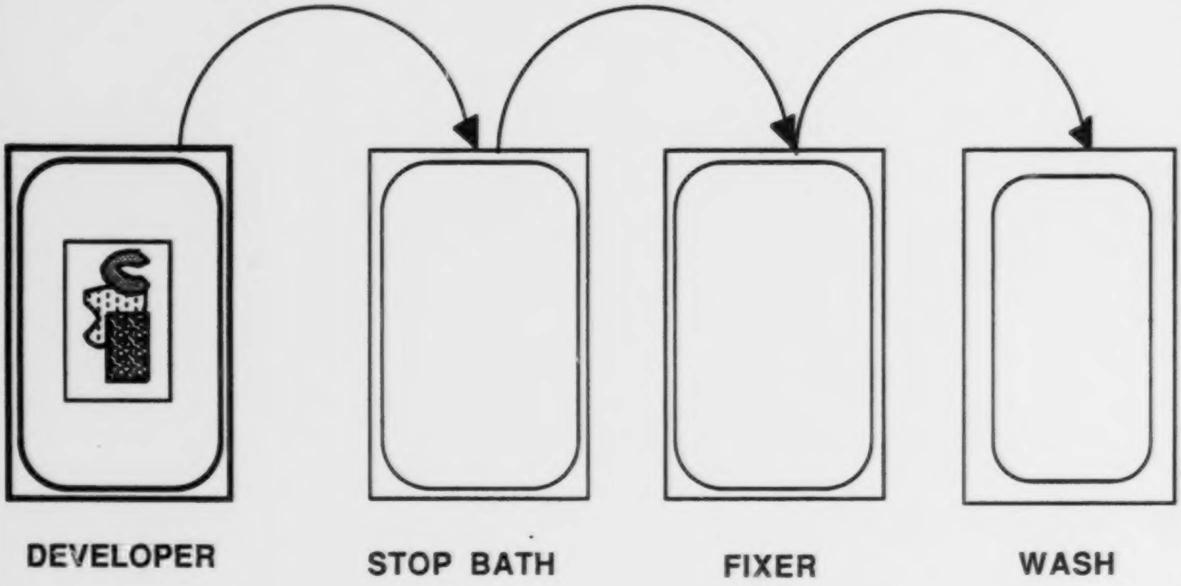
BASIC CAMERA PARTS


Tabs Go On Outside
Tabs Go On Inside
Shutter
Pinhole
Photographic Paper Goes on Back Wall of Outside Box

Sample Pinhole Camera Box

Construction Tips:

1. Box must be light-tight (two boxes as shown works well).
2. Use non-reflective black interior.
3. Make box with easy access to photographic paper.
4. Provide a means to hold photographic paper so it will not move while in the camera.
5. Put tabs on outside of outer box and inside of inner box.


DEVELOPER
STOP BATH
FIXER
WASH

DEVELOPING STEPS

1. Remove photographic paper in safelight.
2. Place in developer face up and agitate.
3. Shake off excess developer and place in stop bath; agitate.
4. Place in fixer face down; agitate.
5. Shake off excess and place in running water.
6. Hang to dry.

Technology Activity Module 6

PROCESSING TRANSPARENCY

FILM

by Janet Bonsall

Technology Activity Module 6

Instructor Component

Activity Objectives:

An exciting way of recording, storing and retrieving information is through the use of color transparency film. Because of handy, inexpensive processing kits, it has become a popular communication medium that everybody can use. Besides that, slides can be processed in a variety of facilities. About all you need is a closet and a sink with warm and cold running water. While doing this TAM, students will have fun and they will learn important communication concepts, too.

Target Competencies:

The student will learn to:
1. Obtain an exposed roll of transparency film which can be processed in a kit.
2. Roll the film onto a processing reel and insert it into a tank.
3. Follow all instructions in the kit when processing film.
4. Mount the transparency film into slide mounts.
5. Conduct an evaluation of the slides.
6. Project the "worthy" slides before a group of people.
7. Conduct a final analysis of photographic work.

TAM Instructions:

Introduction:

Transparencies, or slides as they are often called, are positive images made on reversal film. Like any communication medium, there are both advantages and disadvantages to creating and using them.

One advantage to transparency film is the single-step process; that is, it requires no printing step in order to view the final product. Another, according to Hirsh in a book called Color Photography, is that transparency film offers "a finer grain structure, the best color saturation, maximum color separation, and more subtlety in color and detail". Transparency images look vibrant and life-like.

A major disadvantage of transparency film is that the frames are difficult to view because of their small size; adequate information retrieval requires a projector for large image viewing. Since each transparency is an original, additional images must be made at the time of exposure or by duplication. And during exposure of the transparency film, the camera's f-stop/shutter speed combinations must yield a "perfect" exposure, within 1/3 of a stop, to produce a usable slide. Finally, because there is no printing stage in this process, the exposure and subsequent processing must be nearly flawless to produce usable slides. Nevertheless, most people usually feel the advantages out weigh the disadvantages and choose to use this film.

Slide film is an information storage medium. How well the information is stored depends on many variables; controlling these variables is the challenge of this TAM to the students. This TAM mostly concentrates on processing variables of time, temperature, and agitation and on generally good crafting skills. Slide film has been the traditional medium for communicating with groups. The film is exposed, processed and projected to entertain, inform, and educate groups of 3 to 3,000 people. During the past 20 years, the medium has used multiple screens and dissolve units for "productions" rather than just "slide shows". Transparency film is the preferred medium for publication. Large-format (4x5) transparency film is traditionally used for professional reproduction work. With the advent of laser scanning, a print or transparency can be used depending on the type of equipment the printer uses.

The advantages of this medium include:

Quality - Transparency film, even when projected on large screens, offers fine detail, bright colors, reasonable durability, and longevity.

Interchangeability - Slide shows can be updated without major reconstruction of the original show. This medium, therefore, lends itself well to educational needs as basic information may remain constant while details can undergo constant updating.

Hardware - The slide film can be exposed using any 35mm camera; special slide mounts are available for smaller film sizes. The slide projector is a fairly common piece of equipment in the home, business and educational environments. Transparency film is also available in the 2 1/4 inch square size, which can be projected in a medium-format projector. Large-format transparencies (4x5 inches or larger) are not projected.

Versatility - The slide show can be a simple showing of individual unrelated images, communicating a single idea. Or it can be a full scale production spanning great lengths of time utilizing multiple projectors and integrating other media. The slide show production can be conveniently paused or completely stopped to allow for lecture or discussion.

The disadvantages of this medium include:

Hang ups - Slide shows can "hang up" in the middle of a show due to burned out bulbs and warped slide mounts. By contrast, videos tend to run flawlessly once begun. With improved video technology, organizations are sacrificing the advantages of the slide

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show to the ease of the videocassette. In recent years, the quality of large video projection has increased, making video projection possible for medium-sized groups.

Sophistication - Audiences are used to moving images and are sometimes disappointed with the use of still images to convey ideas. However, the unique attraction of slide shows remains very appealing to most people.

Why do many people wish to process their own transparency film?

To save time - This process takes about 60 minutes including set-up and clean up, plus additional drying time. If an E-6 processor is not readily available, transparency film can take a week or more if sent through an outlet (camera store, drug store, etc.) to a professional lab. Also, some photographers in remote areas have no access to laboratories.

To save money - If many rolls of film are in need of processing, kit processing can be economical.

To alter processing - Professional photographers who expose their film in "other than normal" ways need to adjust processing times. Many labs do not have this type of service. Refer to push/pull processing in the resources.

Easy set-up/clean-up - Though there are several pieces of equipment needed to process transparency film, the set-up and clean-up of the process is relatively simple. All items can be cleaned with water. Air drying takes an additional hour or two, depending on environmental conditions. It should be noted that photographers in a hurry can blow dry the film with a household hairdryer. This author does not recommend this method because dust particles in the air tend to become embedded in the emulsion. Professional hot air cabinet dryers are available on the market for quick, clean drying.

Safety Considerations:

Use rubber gloves and chemical safety goggles when mixing chemistry. Wipe spills immediately; wet areas are slippery and dangerous. In the darkroom, the light switch should be as close to the work table as possible.

Needed Materials:

Supplies Required

a. A roll of E-6 transparency film (two rolls will fit in a standard processing tank at one time). The phrase "Process E-6" will appear both on the film box and on the film cassette.
Important! Kodachrome film CAN NOT be processed with a kit. All other film which ends in "chrome" CAN be processed with a kit. Examples: Agfachrome, Ektachrome, Fugichrome

b. An E-6 Color Slide Processing Kit is available from any well-stocked camera store but is rarely available from discount or department stores.

c. Slide mounts. Plastic mounts are preferred because, unlike cardboard mounts, they will not warp. They are available at a well-stocked camera store.

Equipment

Clean the equipment thoroughly, especially if it has been used previously for another purpose. Soak items in a diluted vinegar solution for about ten minutes to clean them. Note: an illustration of most of the following equipment is available in the E-6 instruction sheet.

a. processing tank and reels
b. mixing vessels
c. thermometer - accurate to +/- 1/2 degree
d. tray or tub - big enough to hold all bottles; must be at least four inches deep
e. bottles to hold chemicals (500 ml/16.9 fl oz.)
f. film clips or clothespins
g. rubber gloves and chemical safety goggles
h. scissors
i. clothesline
j. slide mounts
k. cotton, lintless glove for mounting slides (optional)
l. slide projector

Handouts

Instructions are included in the slide processing kit.

Instructional Resources

See instructions that come with the slide processing kit.

Kodak, THE NEW JOY OF PHOTOGRAPHY, (Reading, MA: Addison-Wesley Publishing, 1985) pp. 256, 288, and 293.

Hirsch, Robert, EXPLORING COLOR PHOTOGRAPHY, (Dubuque, IA: William C. Brown Publishers, 1989)

Bailey and Holloway, THE BOOK OF COLOR PHOTOGRAPHY, (New York: Alfred A. Knopf, Inc., 1984) pp. 42-48.

Upton and Upton, PHOTOGRAPHY, (4th edition) (Glenview, IL: Scott Foresman , 1989) pp. 40-49, 224-229, 236.

A local professional photographer.

A local camera store manager.

Exploring Photography video series from Kodak

Facility

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a. Room which has no light leaks (closet, darkroom). Loading must be done in *complete darkness*. The light switch should be located where it will not be accidently bumped.
b. Sink with hot/cold running water - can be separate from darkroom.
c. Low-dust area for drying. Hang a clothes line in this area.

Management/Logistics

Related TAMS

Any TAM dealing with processing film.

Evaluation and Grading

Use the following scheme to evaluate the developed film. The best way to prevent these errors is to observe the students during processing.

a. Was the film rolled properly on the reel? Check by inspecting the film. Blotches of nondevelopment indicate loading errors, crescent shaped marks indicated that the film was kinked.
b. Did student adhere to proper development times?
c. Did student adhere to proper development temperatures?
d. Did student agitate properly throughout the processing time?
e. Is color realistic? If not, this could be the result of one or more of the following:
   - old film
   - improper storage of film
   - over or under exposure
   - incorrect light source used in exposure
   - processing solution contamination
   - processing solution exhaustion
   - analyze the problem and try again.

Suggested Schedule

Gathering of equipment and set-up	5-10 minutes
Loading the film onto the reel	5-15 minutes
Bringing chemistry to 68 degrees	5-10 minutes
Processing time approximate	16 minutes
Drying time	3 hours

Original mixing of chemistry: ***20 minutes***
(The chemicals in the E-6 kit need to be mixed with water. Bottles must be 16 oz.)

Key Instructional Suggestions:

Safety

a. Wear rubber gloves and chemical safety goggles.
b. Keep floors dry.
c. Keep sharp furniture and objects out of the darkroom.
d. Keep the floor free from debris.

Motivation

If students have exposed their own film, they will have an investment of time and emotion in it. They will be excited and should be closely supervised when they expose the roll of film. Since there is no printing process, the exposure of the slides cannot be adjusted. Slide film is the most difficult to expose due to lack of exposure latitude. (See Upton & Upton, Photography, p. 236) When instructor and students analyze the film later, remember that failing to produce perfect images is "normal". Photographers learn by their mistakes; so will the students.

If students are allowed to work in groups of two or three, the fun and quality of the results are increased. There are times during the process when it seems a person "needs four hands". Try placing one student in charge of watching the clock and calling out the steps. Another can be in charge of handling the tank and pouring the solutions. The third student can be in charge of uncapping and handing the bottles to the person processing and recapping them after use. If two are in the group, one person can do the job of the last two as described above. Group cooperation is a worthy sub-objective for students to achieve.

Prerequisite Information

Review the following or similar references on how to properly expose transparency film: Hirsch p. 84, 88-91 and /or Upton & Upton pp. 40-44 and 113-125.

Demonstrations

Show the students how to do each of these tasks:

a. How to load a roll of film onto a reel - Plastic reels are the easiest to roll; stainless steel reels require more practice.
b. How to mix the processing solutions - Maintain proper temperature.
c. How to agitate the tank - not like a milkshake; about one per second.
d. How to mount slides (optional) - Cut film straight, using gloves.
e. How to load a slide tray so that the photos appear right-side up (optional) - Look at it correctly, so it looks like the original scene, then turn it upside-down but not backwards.

Reinforcement

a. **Intrinsic** - If the film is exposed by the student, the reinforcement is intrinsic. They will be very excited and want to see the results. Film processing is a "recipe" type of procedure which allows the completion of the photographic image-making process. This sense of completion is very motivating to the student.

b. **Extrinsic -** Tell the students that if they work patiently and carefully, the results will be beautiful. Show them stunning examples of images processed and mounted by other photographers or prior students.

c. During the evaluation process, the instructor and other members of the class can comment on photographs as they are projected on a screen or clean wall. In classes of students who are beginners, it is best to "sandwich" comments; that is, to give praise, then a needed improvement, then praise. Or, keep discussions to questions like: Why did Susan take this photo? How does it make you feel? What type of photo is it? (sport, fashion, portrait, etc.)

Attitude

The attitude that should be encouraged is one of precision during:

a. Exposure of the film.
b. Mixing of chemical solutions.
c. Time, temperature, and agitation during the processing.

When exposure and/or processing becomes sloppy at any step, the student must begin with a new roll of film to achieve usable slides. It is also difficult to diagnose problems if the directions have not been followed. When properly processed, the slide's ability to communicate increases significantly over a slide which is too light or dark or is off color.

Remediation/Enrichment

Critical comment in the evaluation of photographs can be *technical* or *aesthetic* or *scientific*.

Some questions to ponder in each area follow:

Technical - Answers to these questions would require a basic amount of photographic knowledge:

a. Is the slide in focus in the most critical part of the image?
b. Is the slide too dark or too light (underexposed, overexposed)?
c. How can this be remedied? (Refer to resources about "exposure".)
d. What filter could be used to improve the color?

Aesthetic - (Many of these questions could be answered before reading supplemental materials.)

a. What message does the photograph convey?
b. Does the background enhance or distract from the main subject?
c. Do the colors enhance or distract from the subject matter?
d. Does the picture tell a story? What is it? (It is interesting to have members of the class surmise this before the photographer tells the story "real".)
e. When was the photograph made? morning, noon, evening, sunny day, cloudy?
f. If one item could be changed about this to improve it, what would that be?
g. What filters could be used to enhance this image?

Scientific - Answers for these questions would necessitate considerable study.

a. Why does the amount of light determine the exposure?
b. What layers of the film are affected by the colors in this photograph?

Summary/ Review

Processing transparency film is a cookbook, recipe-type process. The challenge in the total **transparency film communication system** is in the exposure of the slide film, controlled development, and then presentation of the slides after processing.

Care must be taken in the initial exposure of the film in terms of technical and aesthetic considerations. Technical: Is the photo properly exposed? Is the color realistic? Aesthetic: Does the photograph communicate the correct message? Is there so much "noise" or interference in the photograph that the message is lost? (busy backgrounds, out-of-focus subject, subject too small).

If a sequencing of the slides is undertaken to tell a story (educate, inform, entertain), is there a logical flow of ideas? Is the right message conveyed? Does the audience learn? Are they influenced? Are they amused?

Review Questions:
(See post test)

Glossary

(Most definitions have been taken from the Kodak Customer Service Pamphlet # AA-9.)

Agitate - keeping the solution in gentle motion while processing.

Developer - a solution used to turn the latent image into a visible image on exposed films or photographic papers.

Composition - the arrangement of all elements in a picture--main subject, foreground, background, and supporting subjects.

Emulsion - a thin coating of light-sensitive material in which the image is formed on film and photographic papers.

Exposure latitude - the range of camera exposures that will produce acceptable pictures from a specific film.

Exposure meter (light meter) - an instrument with a light-sensitive cell that measures the light reflected from or falling on a subject; used as an aid to selecting the exposure setting.

Processing - a procedure during which exposed photographic film or paper is developed, fixed and washed to produce either a negative or positive image.

Transparency - a positive photographic image on film, viewed or projected by transmitted light (light shining through film).

Negative - a developed photographic image in which the subject's value tonalities have been reversed from light to dark, and from dark to light.

Print - the photographic image in its final positive state when it has been reproduced on sensitized paper by means of light projected through a negative.

Pre-Assessment:

Consider giving all or part of the following paper and pencil pretest (Circle the best answer):

1. Have you ever used a camera? yes no
2. Did you create prints or slides? Slides prints don't remember
3. Have you ever processed any kind of film? color black & white no

Circle whether true or false.

4. T F Transparency film is specifically made to produce photographic prints.
5. T F Transparency film and slide film are slightly different products.
6. T F Transparency film that you buy at the store is black and white.
7. T F When processing transparency film, safelights can be used when loading the film onto the reel.
8. T F Precision is more important when processing black and white film than in processing color film.
9. T F All color film must be processed by large machinery in a laboratory; only black and white film can be processed in a home darkroom.
10. T F "Agitation" referes to the shaking of the film while it dries.
11. T F Twelve chemicals must be used to process transparency film.
12. T F *Kodachrome* film can be processed in your bathroom sink if you have the right tanks, reels and chemicals.

Key

The first three questions will give you an idea of student's past experience in photography. All of the T - F questions are **false**.

Post-Assessment

1. Discuss the differences between color negative and color slide film.
ANSWER: Transparency film is used to produce slides.
Negative film is used to produce prints.

2. List the advantages and disadvantages of transparency film.
ANSWER: See Instructions Part IV: About transparency film.

3. When would a photographer choose transparency film?
ANSWER: When the image is to be shared with a medium-sized or large group.
When the image is to be used for reproduction in printed material.

4. When would a photographer choose negative (print) film?
ANSWER: When prints are desired.

5. Name the four chemical solutions used to process E-6 film.

ANSWER: It should be noted that this information is taken from a Kodak Hobby Kit. This answer may change if another brand is used. The information may also change as improvements are made in the product:

First developer
Color developer
Bleach fix
Stabilizer

6. When are washes used in the E-6 process?
ANSWER: In between each of the chemical solutions, but not after the stabilizer.

7. How many rolls of 35mm film can be processed in a kit?
ANSWER:

a. Only one
b. 6-8, depending on the number of exposures
c. As many as you like

It should be noted that this information is taken from a Kodak Hobby Kit. This answer may change if another brand is used. Information may also change as improvements are made in the product.

b. IS THE CORRECT ANSWER.

8. What is push/pull processing?
ANSWER: It is the increasing/decreasing of a film's effective film speed (sensitivity)

9. What are the advantages and disadvantages of push/pull processing?
ANSWER: Many beginners feel that push processing is the answer to all of their film choice decisions, whereas, push processing is really a "last ditch effort" in terms of film quality. Encourage study concerning film speed choice. (Upton and Upton p. 92-7) Use the correct film for the lighting conditions whenever possible.

Advantages: Allows the photographer to change the sensitivity of the film and, therefore, obtain photographs which would otherwise not be possible.

Disadvantages: Loss in quality
Less film latitude
Increase in grain

10. Select the responses in the right column that diagnose the problems listed in the left column:
The following has been taken from the Kodak Hobby Pac Instruction booklet. This information may change if another brand is used or if the Hobby Pak undergoes improvements.

1. Slides too light	Overexposure or overdevelopment
2. Slides too dark	Underexposure or underdevelopment
3. Streaks or blotches	Poor agitation
4. Light crescents	Kinked film
5. Unrealistic color balance	Solution contamination or exhaustion

6. Too yellow	Daylight film used with Tungsten illumination or temperature too low
7. Too green or	Daylight film used under fluorescent illumination; temperature too low
8. Too blue	Tungsten film used in daylight or temperature too high
9. All black or clear with no frame numbers	Process out of sequence
10. Large unprocessed areas insufficient	Film touching itself during processing or solution
11. Small black spots	Air bubbles on film in first developer
12. Smoky blacks, light fog	Chemical contamination, push processing, or
13. Gray streaks or blotches	Retained silver due to inadequate bleach-fix action

Other causes and the corrections for these problems are cited on pages 14-16 of the Kodak Hobby Pak Instructions.

Review Question Answers:

(From Student Section)

The students' review questions are identical to those appearing above in the post-test. Answers appear in italics.

Technology Activity Module 6

PROCESSING TRANSPARENCY FILM

by Janet Bonsall

Technology Activity Module 6

Student Component

Introduction

Pictures are all around us. Some of them entertain you, others try to persuade you to buy something, some are educational and some are even disturbing and shocking. All have been created by skillful photographers who had a very definite idea in mind to be communicated to others. Many of the images you see were first made on slide film or transparencies. The purpose of this TAM is to show you how you can process your own transparency film.

Competencies:

In this TAM you will:

a. Obtain an exposed roll of transparency film which can be processed in a kit.
b. Roll the film onto a processing reel and insert it into a tank.
c. Follow all instructions in the processing kit.
d. Mount the transparency film onto slide mounts.
e. Conduct a primary evaluation of the slides.
f. Project the "worthy" slides.
g. Conduct a final analysis of photographic work.

Module Overview:

Motivational Statement

Processing your own film is exciting; it is like magic. It is also a time when you can be an artist and a chemist without having to be able to draw or know anything about chemical equations. Processing your own slides is also a little bit like cooking.The recipe is easy and the results are satisfying. If you have exposed your own film you will have an investment of time and emotion in it. It will be especially exciting to process film that you exposed. When you analyze the finished film product, remember that failing to produce **perfect** images the first time is "normal". All photographers learn by their mistakes; so will you.

Relationship to Context:

This TAM is an example of information storage and retrieval. You will learn how to process color transparency film and see how color dyes can make a permanent image on a polyester (plastic) film.

Key Instructional Suggestions:

Class Presentations

Read the following about the advantages and disadvantages of storing information on transparency film. Your teacher will tell you more about these, too.

Advantages - The advantages of transparency film include that it is a single-step process; that is, it requires no printing step to view the final product.

Disadvantages - The disadvantages of transparency film include that the frames are difficult to view due to their small size; adequate information retreival requires a projector for large image viewing.

About the medium of slides - Slide film has been the traditional medium for communicating with groups. The film is exposed, processed and projected to entertain, inform, and educate groups of 3 to 3,000 people. During the past 20 years, the medium has used multiple screens and dissolve units for "productions" rather than just "slide shows".

Transparency film is the preferred medium for publication. Large-format (4x5) transparency film is traditionally used for professional reproduction work. With the advent of laser scanning, a print or transparency can be used depending on the type of equipment the printer uses.

The advantages of this medium are:

Quality. Transparency film, even when projected on large screens, offers fine detail, bright colors, reasonable durability, and longevity.

Interchangeability. Slide shows can be updated without major reconstruction of the original show. This medium, therefore, lends itself well to educational needs, as basic information can remain constant while details may undergo frequent updating.

Hardware. The slide film can be exposed using any 35mm camera; special slide mounts are available for smaller film sizes.

Versatility. The slide show can be a simple showing of individual unrelated images, communicating a single idea. Or, it can be a full-scale production, spanning great lengths of time, utilizing multiple projectors and integrating other media.

The disadvantages of this medium are:

Hang ups. Slide shows can "hang up" in the middle of a show due to burned out bulbs and warped slide mounts. By contrast, videos tend to run flawlessly once begun.

Sophistication. Audiences are used to moving images and are sometimes disappointed with the use of still images to convey ideas. However, the unique attraction of slide shows remains very appealing to most people.

Why would someone wish to process their own transparency film?

1. To save time.
2. To save money.
3. To alter processing.
4. For the ease of processing set-up and clean-up.

Demonstrations

Your teacher will demonstrate how to do each of the following:

1. Load a roll of film onto a reel.
2. Mix the processing solutions.
3. Agitate the tank.
4. Mount slides.
5. Load a slide tray so that the photos appear right side up.

Safety

Follow these safety rules when processing film:

1. Wear rubber gloves and chemical safety goggles.
2. Keep floors dry.
3. Keep sharp furniture and objects out of the darkroom.
4. Keep theß floor free from debris.

Personal Activity

1. Take a look at magazines that you have at home, or at the covers at a local newsstand. Notice how the colors are usually vibrant and that the color is realistic unless something very different has been attempted. Notice also that the pictures are neither too light nor too dark. Beautiful photographs are the result of precise exposure and processing.

2. Ask to make a dish for dinner (or dessert!) "FROM SCRATCH"--no fair using a box mix. Making a recipe "from scratch" means that you will need to make several measurements with different utensils. Often, ingredients need to be added to specific other ingredients. A recipe for chocolate chip cookies is a good one for starters. It is not too difficult, though it does have a lot of ingredients. The results do not last long though!

3. Visit the library in your hometown to see if they carry any of these excellent books/videos. They will probably be available for purchase at your local camera store or book store:

   The New Joy of Photography by Kodak p. 256, 288, & 293
   Exploring Color Photography by Robert Hirsch - Chapter 5
   The Book of Color Photography by Bailey and Holloway p. 42-48
   Photography (4th edition) by Upton and Upton p. 40-49, 224-229, 236
   Exploring Photography Video Series from Kodak

Visit your local camera store; sales people will be happy to answer your questions about your camera or any part of the E-6 process.

Needed Materials:

Supplies

1. A roll of E-6 transparency film. The phrase "Process E-6" will appear both on the film box and on the film cassette.
   Important! Kodachrome film CANNOT be processed with a kit. All other film which ends in "chrome" CAN be processed with a kit. Examples: Agfachrome, Ektachrome, Fugichrome
2. An E-6 Color Slide Processing Kit is available from any well-stocked camera store but is rarely available from discount or department stores.
3. Slide mounts. Plastic mounts are preferred because, unlike cardboard mounts, they will not warp. They are available at a well-stocked camera store.

Equipment/Machines/Tools

Clean the equipment thoroughly, especially if it has been used previously for another purpose. Soak items in a diluted vinegar solution for about ten minutes to clean.
Note: An illustration of most of the following equipment listed below is available in the E-6 instruction sheet.

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a. processing tank and reels
b. mixing vessels
c. thermometer - accurate to +/- 1/2 degree
d. tray or tub - big enough to hold all bottles; must be at least four inches deep
e. bottles to hold chemicals (500 ml/16.9 fl oz.)
f. film clips or clothespins
g. rubber gloves and chemical safety goggles
h. scissors
i. clothesline
j. slide mounts
k. cotton, lintless glove for mounting slides - optional
l. slide projector - optional

Handouts/Instructional Resources

Instructions are included in the slide processing kit.

Activity Sequence:

Instructor start-up and instructions

Carefully follow the instructor's directions. Watch each demonstration closely before attempting any of the activities. Work with precision and pay attention to safety pointers given by your teacher. Have fun with the developing process!

Pre-Assessment:

Your teacher will be asking the following questions. Circle your answer.

1. Have you ever used a camera?	yes	no	
2. Did you create prints or slides?	Slides	prints	no
3. Have you ever processed any kind of film?	color	black & white	no

Plan of Procedure

Before you begin to process:
1. Acquire an exposed roll of slide film.
2. Practice loading a practice roll of film onto the reel and placing it in the tank.
3. Mix the chemicals.
4. Gather the equipment and set it up on a dry table.
5. Turn off the lights.
6. Load the film onto the reel and place in the tank; secure the lid.
7. Turn on the lights.

Processing

Re-read the instructions.

1. Put the instructions in front of you during the process for reference.
2. Bring chemistry to 68 degrees F.
3. Process according to instructions; processing time is approximately 16 minutes.
4. Hang the film up to dry - using clips or clothespins on the top and bottom.
5. Drying time: 2- 3 hours.
6. Mount the slides into slide mounts.
7. Review.
8. Project the good ones.

Post-Assessment:

Your instructor will give you the final test for the TAM. Use the review questions below to help you study for the test.

Summary & Wrap up

Processing transparency film is a cookbook, recipe-type process. The challenges in the total **transparency film communication system** are in the exposure of the slide film, controlled development, and then the presentation of the slides after processing.

Care must be taken in the initial exposure of the film in terms of technical and aesthetic considerations. Technical: Is the photo properly exposed? Is the color realistic? Aesthetic: Does the photograph communicate the correct message? Is there so much "noise" or interference in the photograph that the message is lost? (busy backgrounds, out of focus, subject too small)

If a sequencing of the slides is undertaken to tell a story (educate, inform, entertain), is there a logical flow of ideas? Is the right message conveyed? Does the audience learn? Are they influenced? Are they amused? Has the purpose been fulfilled?

Review Questions

1. Write three differences between color print film and color slide film.
2. List the advantages and disadvantages of transparency film.
3. When would a photographer choose transparency film?
4. Name the four chemical solutions used to process E-6 film.
5. When are washes used in the E-6 process?
6. How many rolls of 35mm film can be processed in a kit?
7. What is push/pull processing?
8. What are the advantages and disadvantages of push/pull processing?
9. Diagnose each of the following transparency processing errors. Tell what was done incorrectly.

    a. Slides too light

    b. Slides too dark

c. Streaks or blotches

d. Light crescents

e. Unrealistic color balance

f. Too yellow

g. Too green

h. Too blue

i. All black or clear

j. No frame numbers

k. Large unprocessed areas

l. Small black spots

m. Smoky blacks

n. Gray streaks or blotches

Technology Activity Module 7

ON LINE

COMPUTER COMMUNICATIONS

by Adrian Bernagozzi

Technology Activity Module 7

Instructor Component

Introduction:

This TAM covers the technical aspects of on-line computer communications by allowing students to use a micro-computer to link and communicate with other computer systems.

Activity Objectives:

1. Establish a communication link between two micro-computers (of the same or different models) using a serial null-modem connection. Students will set appropriate parameters (data bits, stop bits, parity, duplex, baud rate) to establish the proper protocol for on-line computer communications.
2. Establish a telecommunications link between a micro-computer and a host computer on a local bulletin board system (BBS) using a serial modem connection. Students will learn sign-on procedures to enter and retrieve information.
3. Establish a telecommunications link between a micro-computer and a specialized computer data bank. Students will find specific information by using on-line encyclopedias, domestic airline schedules, and other information of special interest.

Target Competencies:

Upon completion of this TAM, the student should be able to:

1. Diagram the required connections necessary to communicate between the serial ports of two micro-computers.

2. Identify the transmission lines required by the RS-232-C standard for serial communications.

3. Directly link two computers together with a null-modem connection and cable.

4. List the various parameters required to establish a protocol for serial port communications.

5. Establish a protocol to send communications between the serial ports of two micro-computers.

6. Send and receive messages between two micro-computers.

7. Connect the serial port of a micro-computer to a modem.

8. Explain the modulator/demodulator function of the modem.

9. Link a micro-computer with the modem connection to a telephone line.

10. Establish a telecommunications connection between a micro-computer and a bulletin board system and/or computerized database system.

11. Perform the necessary tasks to log-on and log-off a bulletin board system and/or computerized database system.

12. Send and receive messages between a micro-computer and a bulletin board system.

13. Seek out and obtain specific information from a computerized database system.

14. Define technical terms related to on-line computer communications.

TAM Instructions:

Suggested Schedule/Time

One or two weeks would be appropriate for the activities covered in this TAM. This is dependent upon class size, the number of pieces of equipment, and the depth in which the instructor wishes to pursue each activity. The types of activities outlined in this TAM lend themselves to fitting the time allotted, while still accomplishing the basic objectives.

Instructional Handouts

1. RS-232-C Serial Interface Cable Connection to Null-Modem
2. Modem Connection to Another Computer via Telecommunication Lines
3. Serial Port Communications Protocol
4. Basic Commands for Hayes® Compatible Modems
5. Selected Phone Numbers for Bulletin Board and Database Systems

(These appear at the end of the instructor's component.)

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Demonstrations

Prior to demonstrating the activities covered in this TAM, it is important to be familiar with:

1. Making serial port connections for installing both the modem and null-modem.

2. Running the specific communications software on the micro-computer(s).

3. Having telecommunication sessions with the actual micro-computer, bulletin board and database systems being used.

Safety Considerations

While basic precautions must be observed when working with any electronic equipment, it is a good practice to reinforce correct safety practices.

Prerequisite Information

None required.

Related TAMS

Although the following TAM is not a required prerequisite to On-line Computer Communications, the information that is presented could provide appropriate background information to the user:

TAM #2 - Using ASCII for Telecommunication.

Attitudes

It is important that the student(s) understand the legal ramifications of illegal on-line communications. Although breaking into a secured computer system is sometimes glamorized, in reality it is a crime. Review with your students the issue of electronic crime.

Motivation

Once an on-line communication link has been established, the need to obtain specific information is a major motivational force in communicating.

Upon establishing a communications link between two micro-computers (Activity #1), a game of "twenty questions" or some other type of communicating activity can be utilized between the two computers.

Upon establishing a communications link between a micro-computer and a bulletin board system (Activity-based game activity.

Upon establishing a communications link between a micro-computer and a computerized database system (Activity #3), specific information can be obtained. Database systems, provided by some libraries contain bibliographical data on their book holdings. Large commercial database systems, such as CompuServe®, provide on-line encyclopedias, information on airline schedules, stock market reports, and other specific information. Assignments could involve fact-finding missions, such as:

What publisher produced a book by Stephen King in 1989?

What is the difference between the closing stock prices of IBM and Apple computers?

What flight(s) between St. Louis and Pittsburgh arrive before noon and after breakfast?

Remediation/Enrichment

1. Slower learners should be paired with average students, and their activities carefully monitored in order to help them develop confidence in using the bulletin board communication system.

2. Faster learners should do more elaborate modifications of this TAM, such as start a BBS *(requires specialized software)* or perform more in-depth, on-line searches with large database systems.

Review Questions & Answers:

1. What is the device that permits the direct on-line connection of the serial ports of two computers?

   A. Modem
   B. Null-modem
   C. Protocol
   D. Baud
   E. Telecommunications

2. What device is used to modulate a digital binary signal over telecommunication lines?

   A. Modem
   B. Null-modem
   C. RS-232-C cable
   D. Serial port
   E. Telephone

3. What is the term used in communications protocol that refers to the rate of data transmission?

   A. Parity
   B. Word length
   C. Stop bits
   D. Baud
   E. Duplex

4. What information is requested in a database log-on procedure?

   A. Name
   B. Handle
   C. Location (10-20)
   D. Telephone number
   E. Password

5. What type of information can be obtained from commercial on-line database systems, such as The Source®, CompuServe®, or DELPHI®?

   A. Prices of the New York Stock Exchange
   B. National weather
   C. Domestic airline schedules
   D. All of the above
   E. None of the above

Pre- and Post-Assessment:

Pretest - The review questions could be used to ascertain a student's prior knowledge and provide an introduction to the technical concepts to be covered in the TAM.

Post-test - After completing the TAM, retest the students with the review questions to determine what they learned.

Evaluation/Grading

Evaluation, and hence grading, should be based on cognitive knowledge, psychomotor activities (skills), and effective domains. The conceptual knowledge can be tested by written examination. The ability to successfully communicate on-line with another computer system can be signified by completion of the activities in this TAM. The effective domain (student's attitude) can be observed during the execution of the TAM activities.

Supplies Required

Activity #1

2 each	Micro-computers with RS-232-C serial port (same or different models)
2 each	DB-25 serial interface cable - 6 feet *(Radio Shack ® 26-240 or equivalent)*
1 each	Null-modem adapter *(Radio Shack ® 26-1496 or equivalent)*
2 each	Telecommunications software

Activities #2 and #3

1 each	Micro-computer with RS-232-C serial port
1 each	DB-25 serial interface cable - 6 feet *(Radio Shack ® 26-240 or equivalent)*
1 each	Modem (AT&T Bell 212A compatible)
1 each	Telecommunications software

Additional Supplies Required by Other Computers

DB-25 Gender changer(s) *(Radio Shack® 26-243, 26-1495 or equivalent)*

DB-25 to Mini DIN-8 cable(s) for Macintosh® *(MacWarehouse® ACC-0269 or equivalent)*

DB-25 to DB-9 cable(s) for IBM® PC/AT compatibles *(Global® C-4236 or equivalent)*

Instructional Outline

- A. Introduction to on-line computer communications
  - 1. Definition
  - 2. Technological Overview
  - 3. Use in Society
- B. RS-232-C serial communications port
  - 1. Pin Assignments
    - a. Chassis Ground (GND) (pin 1)
    - b. Transmitted Data (TD) (pin 2)
    - c. Received Data (RD) (pin 3)
    - d. Request To Send (RTS) (pin 4)
    - e. Clear To Send (CTS) (pin 5)
    - f. Data Set Ready (DSR) (pin 6)
    - g. Electrical Ground (GND) (pin 7)
    - h. Data Terminal Ready (DTR) (pin 20)
  - 2. Direct Serial Port Interface
    - a. Serial Cable Connection
      - 1) DB-25 connector (standard)
      - 2) DB-9 connector for Macintosh computers
      - 3) Mini DIN-8 connector for IBM computers
    - b. Null-modem Adaptor
      - 1) Crossing pin 2 (TD) with pin 3 (RD)
- C. Communications protocol
  - 1. Baud rate settings
    - a. 110 baud
    - b. 300 baud
    - c. 1200 baud
    - d. 2400 baud
  - 2. Duplex settings
    - a. Full duplex
    - b. Half duplex
  - 3. Parity settings
    - a. Even parity

        - b. Odd parity
        - c. No parity
    - 4. Stop bits settings
        - a. 1
        - b. 1.5
        - c. 2
    - 5. Word length settings
        - a. 7 bits
        - b. 8 bits
- D. Telecommunications
    - 1. Modem (modulator - demodulator)
        - a. Modulation
        - b. Demodulation
    - 2. Modem connection
        - a. Serial port cable connection
        - b. Telecommunications line connection
        - c. Power line connection
- E. Bulletin Board Systems (BBS)
    - 1. Use of BBS
    - 2. Local BBS telephone number(s)
    - 3. BBS procedures
        - a. Logging on
        - b. Sending messages
        - c. Retrieving messages
        - b. Logging off
- F. Computerized database systems
    - 1. Use of databases
    - 2. Accessing a database
        - a. Telephone numbers(s) and connect time
        - b. Log-on procedure
            - 1) User ID
            - 2) Password
            - 3) Account number

c. Retrieving information
    1) Menu-driven option
    2) Log-off procedure

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Glossary:

ASCII - (American Standard Code for Information Interchange) -- A standard for assigning all keyboard characters to one of 128 codes that can be used for transmitting data.

Baud rate - (Bits of AUdio Data per second)- The measurement of the amount of binary data sent over a telephone line as audio tones in one second.

BBS - (Bulletin Board System) -- An on-line computer system that can be called by micro-computer/modem users for leaving and retrieving messages. Usually, a BBS is supported by a computer club.

Binary code - A string of values (byte) comprising of only the numbers "0" and "1" representing the binary equivalent of an ASCII character code.

Bit - The smallest piece of data, represented by either a "0" or "1".

Byte - Seven or eight bits of data representing the binary equivalent of an ASCII character code.

Carrier - The signal on a telecommunication line that can be used for modem communications.

Communications software - An applications program that instructs the computer for transmitting and receiving data through a serial port.

Connect time - The amount of time a computer is connected to an on-line computer system.

Database - An organized collection of information. On-line computerized databases can be accessed by computer to search and obtain information over common telephone lines.

Download - Retrieving information from an on-line computer.

Echo - A telecommunications format that permits verification of data by allowing the data to be sent back from the receiving terminal to the originating terminal.

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Electronic mail - A computerized telecommunications network used to send messages from one computer terminal to another computer terminal or device.

Emulation - The ability of a micro-computer and software package to mimic a computer terminal such as the DEC VT-100. The on-line service perceives the incoming data as coming from that particular type computer terminal, rather than the actual computer terminal type being used.

Full duplex - A telecommunications format that permits data to travel in both directions at the same time.

Half duplex - A telecommunications format that permits data to travel in only one direction at a time. **Log off**- Procedure for ending an on-line telecommunications session.

Log on - Procedure for gaining access to an on-line communications system. Usually includes providing user ID, password, and/or account number.

Modem - **MO**dulator/**DEM**odulator -- An electronic device that transforms a digital computer signal into an analog form suitable for transmission over common telephone lines. In the sending mode, the modem converts the binary signals coming from the computer into two audio tones. In the receiving mode, the modem converts the audio tones into the digital binary codes needed by the computer.

Parameter - Variable settings that limit a process. In telecommunications, these parameters include baud rate, stop bits, word length, parity, and duplex settings.

Parity - A telecommunications format that enables computers to test receiving accuracy. The settings are "odd", "even" or "none."

Password - A secret identification code that is needed to gain access to a secured on-line computer system.

Protocol - A pre-defined exchange of signal formats between two computers that set up the conditions for data transmission. Also called "handshaking protocol".

Serial port - An electrical plug or socket interface on a computer that permits the flow of bits, in single file, to and from a peripheral device such as a modem.

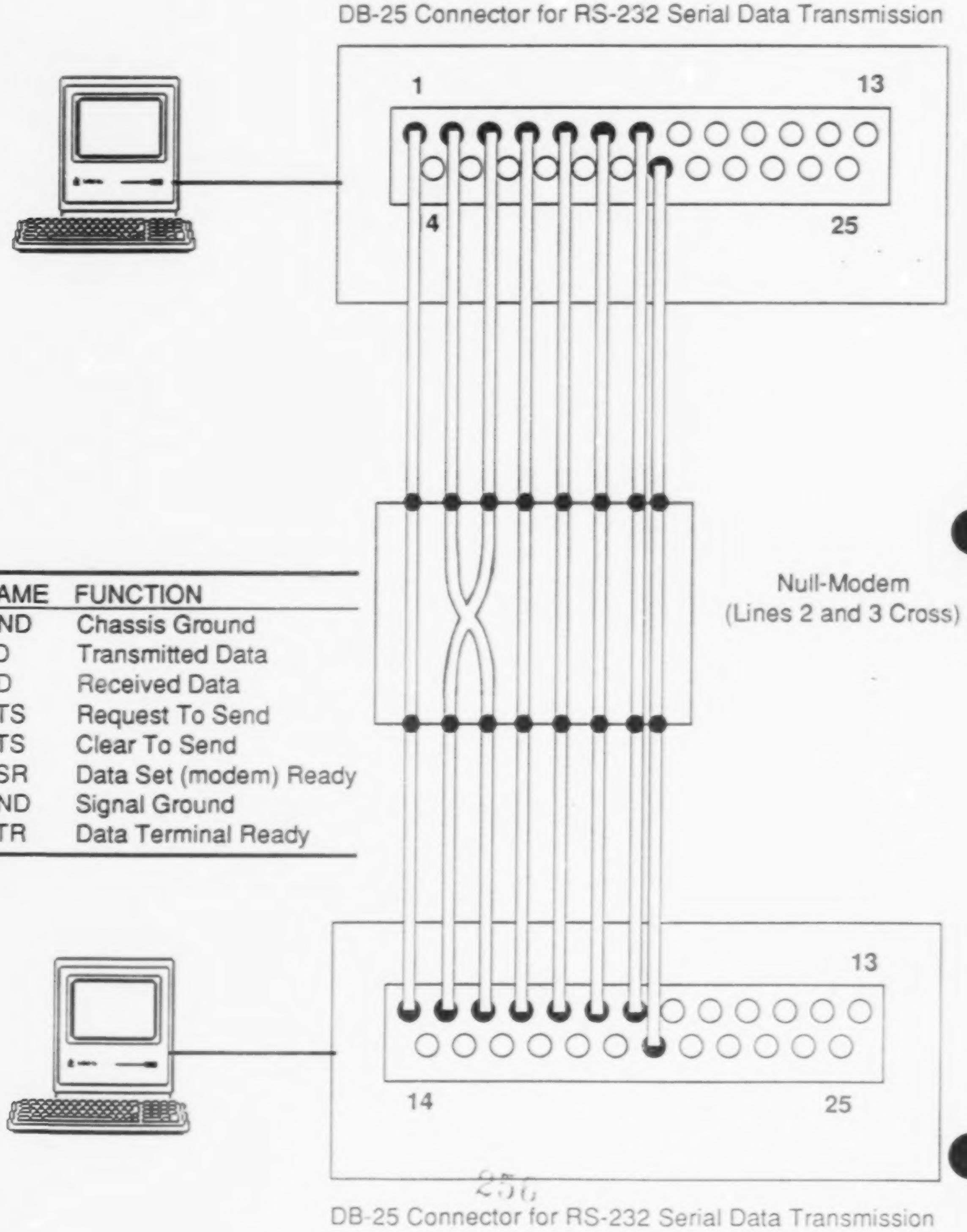
Stop bit - A telecommunications format that permits the receiving device to recognize the end of a transmitted byte. It is the last transmitted bit(s) in each character (byte). There are usually one or two stop bits for every seven or eight data bits.

Telecomputing - The process of two computers conversing over telephone lines or some other channel of electronic communications.

Upload - Transmission of data to another computer.

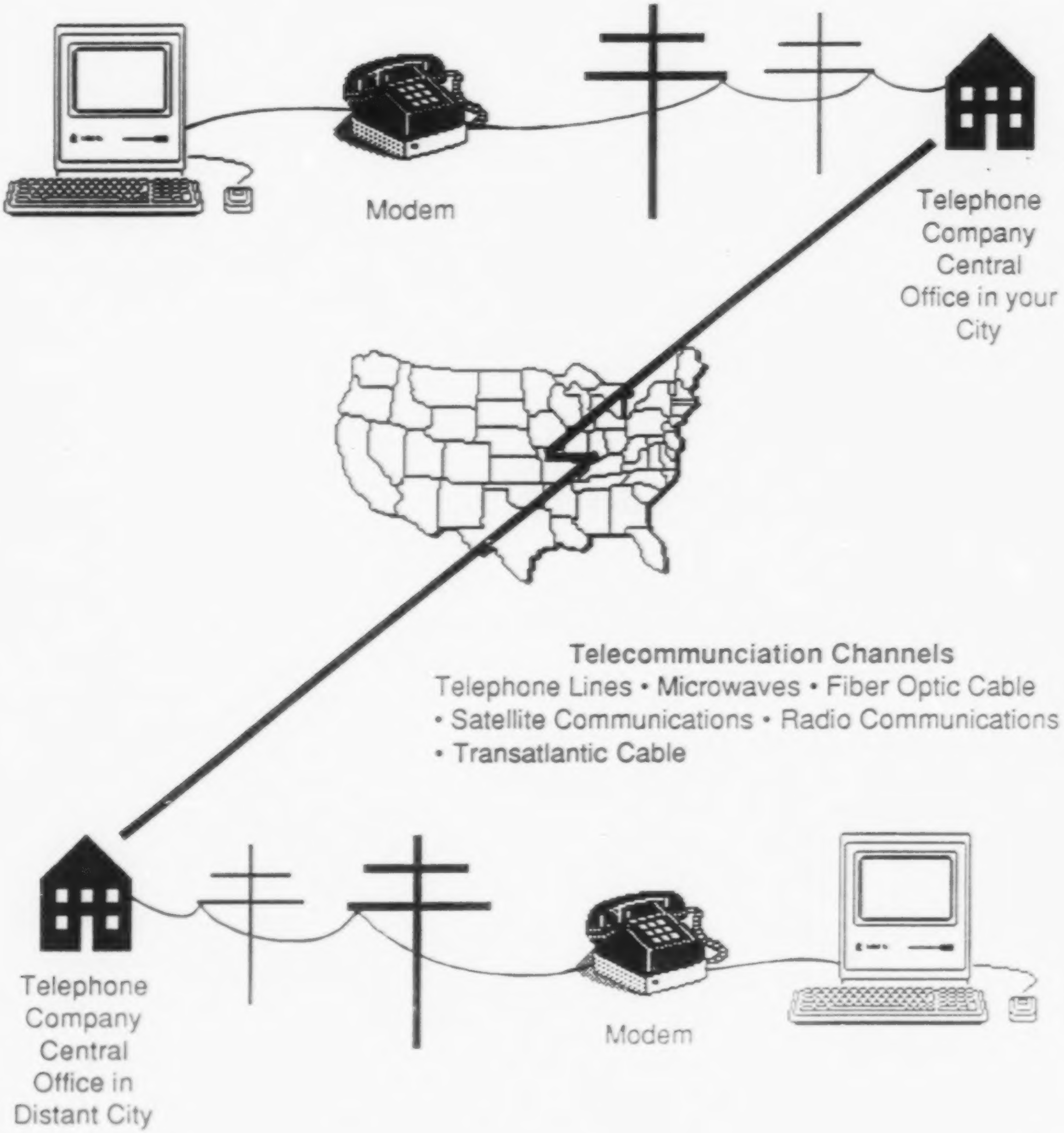
Word length - A telecommunications format that sets the number of data bits in a computer byte. Usually seven or eight data bits.

RS-232 Serial Interface Cable Connection to Null-Modem


DB-25 Connector for RS-232 Serial Data Transmission
1
13
14
25
Null-Modem
(Lines 2 and 3 Cross)
13
14
25
DB-25 Connector for RS-232 Serial Data Transmission

PIN	NAME	FUNCTION
1	GND	Chassis Ground
2	TD	Transmitted Data
3	RD	Received Data
4	RTS	Request To Send
5	CTS	Clear To Send
6	DSR	Data Set (modem) Ready
7	GND	Signal Ground
8	DTR	Data Terminal Ready

Modem Connection to Another Computer via Telecommunication Lines


Modem
Telephone Company Central Office in your City
Telephone Company Central Office in Distant City
Modem

Telecommunciation Channels
Telephone Lines • Microwaves • Fiber Optic Cable
• Satellite Communications • Radio Communications
• Transatlantic Cable

Serial Port Communications Protocol

Parameter Settings

Protocol refers to the basic settings that must be common between the serial ports of the micro-computers before a communications link can be established. If different protocols between two micro-computers are used, "garbage" characters or nothing at all will be communicated.

Communications protocol is divided into several parameters. Each parameter must be set up identically the same for each micro-computer to establish communications properly.

The parameters of serial port communications protocol are:

BAUD RATE - The measurement of the amount of binary data sent over a telephone line as audio tones in one second. Settings are **300**, **1200**, **2400**, and **4800.**

ECHO - The verification of data by sending the data from the receiving terminal to the originating terminal. Settings are **ON** and **OFF**.

DUPLEX - Permits data to travel in only one or both directions at the same time. Settings are **HALF** and **FULL**.

PARITY - Enables computers to test the accuracy of receiving transmitted data. Settings are **ODD**, **EVEN** and **NONE**.

STOP BITS - Permits the receiving device to recognize the end of a transmitted character. Settings are **1**, **1.5**, and **2**.

DATA BITS - The number of bits of data in a transmitted byte. Settings are **7** and **8**.

Establishing Protocol

Whenever possible, consult the documentation for the specific bulletin board or database system to determine the exact settings of parameters for the protocol. If documentation is not available, the following parameter settings usually work:

Set the Baud to 300 or 1200, Data Bits to 8, Stop Bits to 1, Duplex to FULL, and parity to NONE.

If communications are not established, then hang up, set your parameters to EVEN parity and 7 Data Bits, and call back. If communications are still not established, try changing the baud rate.

If communications have been established but you can't see what has been typed on the screen, switch to HALF duplex. If there are double characters ("HHEELLLLOO") when using HALF duplex, switch to FULL duplex.

Basic Commands for Hayes® Compatible Modems

The "AT" Command Set

Many modems today support the Hayes® Smart Modem "AT" command set. Refer to the modem manual for more details. A few of these commands are provided below:

The AT command is used to get the attention of the modem.

Type the letters AT and press the Return Key. The modem should respond with "OK" if the serial port settings are recognized by the modem.

The modem dialing command is ATDT for a touch-tone (push-button) telephone line, and ATDP for a pulse (rotary dial) telephone line. The dialing command should be followed with the telephone number to be called and the Return Key. For example:

```
ATDT 9,555-1212 [return]
```

The nine is used to obtain an outside line from most business phones. The hyphen is ignored by the modem. A pause in dialing is initiated by inserting a comma within the number. Commas can be strung together for longer pause durations (two-second pause per comma).

To disconnect the modem (hang up):

1. Wait at least three seconds since the last character key was pressed.

2. Type three plus-signs quickly (don't press return).

3. When the modem responds with the message "OK", enter the command ATH and Return to disconnect the modem from the phone line.

Technology Activity Module 7

ON LINE

COMPUTER COMMUNICATIONS

by Adrian Bernagozzi

Technology Activity Module 7

Student Component

Introduction:

On-line computer communications are widely used within our society to send and receive messages. These computer communications are used today by travel agents to book seats on commercial flights, motel clerks to make room reservations, salespersons to obtain credit card approvals, and bank customers to check their balances at automatic teller machines and to send mail electronically!

This TAM covers the technical aspects of on-line computer communications by allowing you to use a micro-computer to link and communicate with other computer systems. The module consists of several activities which will provide you with experiences and understanding of the technical concepts regarding on-line computer communications.

In Activity #1, you will link two micro-computers together to send messages from one computer to the other.

In Activity #2, you will learn how a modem permits the same linkage between any two computers in the world via telecommunications lines.

Activities #2 and #3 will permit you to obtain information from bulletin board systems (BBS) and other computerized data bases.

Key Information:

In this TAM, you will be expected to take an active role by actually using a computer to communicate to a selected location. Homework and outside readings will be assigned. Your instructor will be presenting information relating to safety, technical terminology, and conceptual information.

Possibly, you may have already obtained the information and experiences presented in this TAM by your participation in seminars presented by a local computer club or through your acquaintance with a computer hobbyist. If this is the case, relate this to your instructor. Before relying on you as a experienced learner during the TAM activities, your instructor will verify your knowledge and experience with a pre-assessment evaluation.

Target Competencies

Upon completing of the TAM activities, you should be able to:

1. Diagram the required connections necessary to communicate between the serial ports of two micro-computers.

2. Identify the transmission lines required by the RS-232-C standard for serial communications.

3. Directly link two computers together with a null-modem connection and cable.

4. List the various parameters required to establish a protocol for serial port communications.

5. Establish a protocol to send communications between the serial ports of two micro-computers.

6. Send and receive messages between two micro-computers.

7. Connect the serial port of a micro-computer to a modem.

8. Explain the modulator/demodulator function of the modem.

9. Link a micro-computer with the modem connection to a telephone line.

10. Establish a telecommunications connection between a micro-computer and a bulletin board system and/or computerized data base system.

11. Perform the necessary tasks to log-on and log-off a bulletin board system and/or computerized data base system.

12. Send and receive messages between a micro-computer and a bulletin board system.

13. Seek out and obtain specific information from a computerized data base system.

14. Define technical terms related to on-line computer communications.

Topical Outline:

- A. Introduction to on-line computer communications
    - 1. Definition
    - 2. Technological overview
    - 3. Use in society
- B. RS-232-C serial communications port
    - 1. Pin Assignments
        - a. Chassis Ground (GND) (pin 1)
        - b. Transmitted Data (TD) (pin 2)
        - c. Received Data (RD) (pin 3)
        - d. Request To Send (RTS) (pin 4)
        - e. Clear To Send (CTS) (pin 5)
        - f. Data Set Ready (DSR) (pin 6)
        - g. Electrical Ground (GND) (pin 7)
        - h. Data Terminal Ready (DTR) (pin 20)
    - 2. Direct serial port interface
        - a. Serial cable connection
            - 1) DB-25 connector (standard)
            - 2) DB-9 connector for Macintosh computers
            - 3) Mini DIN-8 connector for IBM computers
        - b. Null-modem adaptor--crossing pin 2 (TD) with pin 3 (RD)
- C. Communications protocol
    - 1. Baud Rate Settings
        - a. 110 Baud
        - b. 300 Baud
        - c. 1200 Baud
        - d. 2400 Baud
    - 2. Duplex settings
        - a. Full duplex
        - b. Half duplex
    - 3. Parity settings
        - a. Even parity
        - b. Odd parity

   4. Stop bits settings
      a. 1
      b. 1.5
      c. 2
   5. Word Length Settings
      a. 7 bits
      b. 8 bits

D. Telecommunications
   1. Modem (modulator - demodulator)
      a. Modulation
      b. Demodulation
   2. Modem Connection
      a. Serial port cable connection
      b. Telecommunications line connection
      c. Power line connection

E. Bulletin Board Systems (BBS)
   1. Use of BBS
   2. Local BBS telephone number(s)
   3. BBS Procedures
      a. Logging on
      b. Sending messages
      c. Retrieving messages
      d. Logging off

F. Computerized data base systems
   1. Use of data bases
   2. Accessing a data base
      a. Telephone Numbers(s) and connect time
      b. Log-on procedure
         1) User ID
         2) Password
         3) Account number
      c. Retrieving information
         1) Menu-driven options
      d. Log-off procedure

Glossary

ASCII - American Standard Code for Information Interchange -- A standard for assigning all keyboard characters to one of 128 codes that can be used for transmitting data.

Baud Rate - Bits of AUdio Data *(per second)* -- The measurement of the amount of binary data sent over a telephone line as audio tones in one second.

BBS - Bulletin Board System -- An on-line computer system that can be called by micro-computer/modem users for leaving and retrieving messages. Usually a BBS is supported by a computer club.

Binary Code - A string of values (byte) comprising of only the numbers "0" and "1" representing the binary equivalent of an ASCII character code.

Bit - The smallest piece of data, represented by either a "0" or "1".

Byte - Seven or eight bits of data representing the binary equivalent of an ASCII character code.

Carrier - The signal on a telecommunication line that can be used for modem communications.

Communications Software - An applications program that instructs the computer to transmit and receivie data through a serial port.

Connect Time - The amount of time a computer is connected to an on-line computer system.

Data base - An organized collection of information. On-line computerized data bases can be accessed by computer over common telephone lines to search and obtain information.

Download - Retrieving information from an on-line computer.

Echo - A telecommunications format that permits verification of data by allowing the data to be sent back from the receiving terminal to the originating terminal.

Electronic Mail - A computerized telecommunications network used to send messages from one computer terminal to another computer terminal or device.

Emulation - The ability of a micro-computer and software package to mimic a computer terminal such as the DEC VT-100. The on-line service perceives the incoming data as coming from that particular type computer terminal, rather than the actual computer terminal type being used.

Full Duplex - A telecommunications format that permits data to travel in both directions at the same time.

Half Duplex - A telecommunications format that permits data to travel in only one direction at a time.

Log off - Procedure for ending an on-line telecommunications session.

Log on - Procedure for gaining access to an on-line communications system. Usually includes providing user ID, password, and/or account number.

Modem - **MO**dulator/**DEM**odulator -- An electronic device that transforms a digital computer signal into an analog form suitable for transmission over common telephone lines. In the sending mode, the modem converts the binary signals coming from the computer into two audio tones. In the receiving mode, the modem converts the audio tones into the digital binary codes needed by the computer.

Parameter - Variable setting that delimits a process. In telecommunications, these parameters include baud rate, stop bits, word length, parity, and duplex settings.

Parity - A telecommunications format that enables computers to test the accuracy of receiving a transmitted byte. The settings are "odd", "even" or "none."

Password - A secret identification code that is needed to gain access to a secured on-line computer system.

Protocol - A pre-defined exchange of signal formats between two computers that set up the conditions for data transmission. Also called "handshaking protocol".

Serial port - An electrical plug or socket interface on a computer that permits the flow of bits, in single file, to and from a peripheral device such as a modem.

Stop bit - A telecommunications format that permits the receiving device to recognize the end of a transmitted byte. It is the last transmitted bit(s) in each character (byte). There are usually one or two stop bits for every seven or eight data bits.

Telecomputing - The process of two computers conversing over telephone lines or some other channel of electronic communications.

Upload - Transmission of data to another computer.

Word length - A telecommunications format that sets the number of data bits in a computer byte. Usually seven or eight data bits.

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TAM #7: ON-LINE COMPUTER COMMUNICATIONS

Activity #1

Task:

Establish an on-line communications link between two micro-computers by using a null-modem connection to the serial ports.

Supplies Required:

2 each	Micro-computers with RS-232-C serial port (same or different models)
2 each	DB-25 serial interface cable - 6 feet *(Radio Shack ® 26-240 or equivalent)*
1 each	Null-modem adapter *(Radio Shack ® 26-1496 or equivalent)*
2 each	Telecommunications Software

Additional supplies that may be required

DB-25 gender changer(s) *(Radio Shack® 26-243, 26-1495 or equivalent)*

DB-25 to Mini DIN-8 Cable(s) for Macintosh® *(MacWarehouse® ACC-0269 or equivalent)*

DB-25 to DB-9 cable(s) for IBM® PC/AT compatibles *(Global® C-4236 or equivalent)*

Procedure:

1. Turn the power off to the two micro-computers.

2. Connect a DB-25 serial interface cable to the serial port of one of the micro-computers. (The use of a DB-9 or Mini DIN 8 cable adaptor may be necessary).

3. Connect another DB-25 serial interface cable to the serial port of the other micro-computer. (The use of a DB-9 or Mini DIN 8 cable adaptor may be necessary).

4. Connect the remaining ends of the two DB-25 serial interface cables to a null-modem. (The use of DB-25 gender changers may be necessary to make this connection).

5. Turn both micro-computers on and run the communications software.

6. Set the communications protocols for both micro-computers to:

Baud	300
Parity	none
Data bits	7
Stop bits	1
Echo	on

Activities:

1. Verify that on-line communications between the two micro-computers have been established by typing messages back and forth between the computers. Try typing a question or telling a joke.

2. Having established an on-line communication between the two micro-computers, note what happens to the communications link when each protocol setting is changed on one of the micro-computers only.

3. Re-establish on-line communications to the two micro-computers by setting the protocols to the levels listed in the procedure section. Then set the baud rate to both micro-computers to a higher or lower value and note the effect that the baud rate has on the speed of transmission between when sending large ASCII files between the two micro-computers.

4. Set up a communications session between the two micro-computers. Your instructor may have suggestions on the type of information that should be sent.

Instructional Handouts:

1.RS-232-C serial interface cable connections to null-modem

2.Serial port communications protocol

TAM #7: ON-LINE COMPUTER COMMUNICATIONS

Activity #2

Task:

Establish a telecommunications link between a micro-computer and a Bulletin Board System.

Supplies Required:

1 each	Micro-computer with RS-232-C serial port
1 each	DB-25 serial interface cable - 6 feet *(Radio Shack ® 26-240 or equivalent)*
1 each	Modem (AT&T Bell 212A compatible)
1 each	Telecommunications software

Additional supplies that may be required

DB-25 gender changer(s) *(Radio Shack® 26-243, 26-1495 or equivalent)*

DB-25 to Mini DIN-8 cable(s) for Macintosh® *(MacWarehouse® ACC-0269 or equivalent)*

DB-25 to DB-9 cable(s) for IBM® PC/AT compatibles *(Global® C-4236 or equivalent)*

Procedure:

1. Turn the power to the micro-computer off.

2. Connect a DB-25 serial interface cable to the serial port of the micro-computer. (The use of a DB-9 or Mini DIN 8 cable adaptor may be necessary).

3. Connect the remaining end of the DB-25 serial interface cable to a null-modem. (The use of DB-25 gender changer may be necessary to make this connection).

4. Connect the telephone line to the modem.

5. Turn the power to the modem and micro-computer on.

6. Install and run the telecommunications software.

7. Dial the number of a local bulletin board system.

8. Follow the prompts to log on to the bulletin board system.

Activities:

1. Browse the bulletin board to become familiar with the types of information that it contains.

2. Check the bulletin board for specific information that is of particular interest or that which has been assigned by your instructor.

3. Check the bulletin board for messages left to you from your instructor or classmates. This is known as electronic mail or E-mail.

4. Ask your instructor if you should send or retrieve E-mail messages on the bulletin board system.

Instructional Handouts:

1. Modem Connection To Another Computer via Telecommunication Lines
2. Serial Port Communications Protocol
3. Basic Commands for Hayes® Compatible Modems

TAM #7: ON-LINE COMPUTER COMMUNICATIONS

Activity #3

Task:

Establish a telecommunications link between the modem connection to the serial port of a micro-computer and a database system. The database system may be a computerized library card catalog, a computerized information system from a government agency, or one of the commercially available database systems; such as The Source®, CompuServe®, and DELPHI ®.

Supplies Required:

1 each	Micro-computer with RS-232-C serial port
1 each	DB-25 serial interface cable - 6 feet *(Radio Shack ® 26-240 or equivalent)*
1 each	Modem (AT&T Bell 212A compatible)
1 each	Telecommunications software

Additional supplies

DB-25 gender changer(s) *(Radio Shack® 26-243, 26-1495 or equivalent)*

DB-25 to Mini DIN-8 cable(s) for Macintosh® *(MacWarehouse® ACC-0269 or equivalent)*

DB-25 to DB-9 cable(s) for IBM® PC/AT compatibles *(Global® C-4236 or equivalent)*

Procedure:

1. Turn the power to the micro-computer off.

2. Connect a DB-25 serial interface cable to the serial port of the micro-computer. (The use of a DB-9 or Mini DIN 8 cable adaptor may be necessary).

3. Connect the remaining end of the DB-25 serial interface cable to a null-modem. (The use of DB-25 gender changer may be necessary to make this connection).

4. Connect the telephone line to the modem.

5. Turn the power to the modem and micro-computer on.

6. Install and run the telecommunications software.

7. Dial the number of the database system.

8. Follow the prompts to log on to the database system. (If necessary, your instructor will provide an appropriate *user ID* and *password* to gain access to the database system).

Activities:

1. Check the main menu of the database system to become familiar with the types of information that is available. Note how the information is categorized.

2. Check the database for specific information that is of particular interest or that which has been assigned by your instructor.

3. Ask your instructor for specific information you should retrieve from the database system.

Instructional Handouts:

1. Modem Connection To Another Computer via Telecommunications Lines
2. Serial Port Communications Protocol
3. Basic Commands for Hayes® Compatible Modems

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Technology Activity Module 8

LASER
APPLICATIONS

by Craig Adams

Technology Activity Module 8

Instructor Component

Activity Objectives:

Lasers have become very important in today's society. In this TAM the various uses of the laser as it applies to communication technology will be explored. Developing working models of the LED transmitter, burglar alarm, seismograph and a test for laser modulation are provided as activity options. Students will develop a stronger appreciation for the laser as a tool in their lives.

Target Competencies:

1. Use safe procedures when using the laser.
2. Explain the importance of the role lasers play in our society.
3. Explain the importance of electrical communication, warning and sensing devices.
4. Correctly use terms associated with the laser and its use.
5. Give advantages and disadvantages of using the laser for communication systems.
6. Solve problems relating to the use of the laser in each activity.
7. Explain the impact lasers have made on the use of electrical communication, warning and sensing devices.

TAM Instructions:
Introduction

The purpose of this module is to show the many roles lasers play in communication, not only in sending and receiving of messages via fiber optics, but also through the use of warning and sensing devices. Students will participate in five activities. In each activity students model an actual laser system used in a particular area of communication. Areas

Safety Considerations

The Center for Devices and Radiological Health (CDRH) has a strict set of laws regarding the use of commercially bought lasers. Most of the lasers sold on the surplus market do not comply with the CDRH regulations. Below is a list of some of the simple functions to which the regulations pertain.

Dangers of Laser Light Radiation: The eyes are very susceptible to damage by the effects of focused laser light, andthe retina is the most susceptible. The longer the exposure and the more focused the beam, the greater the chance of damage to the retina. Retinal damage from the typical hobby laser with outputs of less than 10 milliwatts is rare, but it is good practice to make a habit of guarding against both accidental and intentional exposure. For that reason, it is a good idea to purchase a set of goggles, especially if certain practices cause the beam to strike your eyes. Even with goggles, some light can still penetrate, so use caution.

Dangers of High Voltage Electrocution: When using certain laser diode systems of the LED transmitter suggested in this TAM, there is no threat of exposure to high voltage due to the use of small household batteries. However, when working with all gas lasers, such as the HeNe hobby laser, it is necessary to use extreme caution due to the high voltage power supplies. These power supplies can increase the voltage from 12 volts DC or 120 volts AC to several thousand volts. Unfortunately, some experiments tend to disregard this since the amperage is so low. Although shock from a laser power supply may not kill you, it could cause you to jerk in such a manner that you could either fall or drop the laser--or worse yet, cause someone else injury. Below is a list of some high voltage precautions:

- Do not apply power to the laser until all the high-voltage wires and components are shielded or insulated.
- Do not work near a laser that has high-voltage components exposed.
- Provide an interlock switch to protect against accidental electrocution when servicing the laser.
- Discharge the tube and power supply to avoid shock after power has been removed.
- Affix a "Danger--High Voltage" sticker to the power supply and tube to warn others that high voltages are present.
- Install a power key switch to prevent unauthorized use.
- Never leave the laser or power supply unattended. A laser is not a toy, and students should not be allowed to use one without your supervision. For maximum security, lock the laser in a desk or filing cabinet to prevent unauthorized use.

Danger of AC Electrocution: Most of the lasers that will be used operate on common AC house current. You should observe the same precautions relevant when working with any appliance. **AC voltage can and does kill!!** Below are some basic safety precautions for working with AC voltage:

- Always keep AC circuits covered.
- Keep AC circuits physically separate from low-voltage DC circuits.
- All AC power supplies should have fuse protection on the incoming hot line. The fuse should be adequately rated for the circuit but should allow a fail-safe margin in case of short circuit.
- When troubleshooting ac circuitry, keep one hand in your pocket at all times. Use the other hand to manipulate the voltmeter or oscilloscope probe. Avoid the situation where one hand touches ground and the other a live circuit. The a AC flows from one hand to the other, through your heart.
- When possible, place AC circuits in an insulated Bakelite or plastic chassis. Avoid the use of metal chassis.
- Double- and triple-check your work before applying power. If you can, have someone else inspect your handiwork before you switch the circuit on for the first time.
- Periodically inspect AC circuits for worn, broken, or loose wires and components; make any necessary repairs.

Project safety: Most of the projects in this TAM will require some construction or electrical work. All shop safety precautions concerning the use of woodworking, metalworking, electronics, and plastics equipment, as well as basic hand tool safety, MUST be observed. Wear safety classes in the shop at all times.

Needed Materials:

Supplies

See resources for a description of where these can be purchased,or how they can be made. All parts may be obtained in kit form through: DDK Technologies, 1007 N. College, Columbia, MO 65201.

a. LED Transmitter
    LM555 timer IC
    100 kilohm potentiometer
    10 kilohm resistor
    0.1 microfarad electrolytic capacitor
    33 microfarad electrolytic capacitor
    0.0015 mica or Hi-Q disc capacitor
    Light emitting diode (high output)
    SPST switch
    Printed Circuit Board (diagram and schematic provided)
    PVC end plug, schedule 40
    1/8 inch miniature phone jack
    1/8 inch miniature phone plug
    Knob for potentiometer
    6 Volt DC battery holder
    4 AA batteries

b. LED receiver
LM741 operational amplifier IC
LM386 audio amplifier IC
220 kilohm resistor
1 kilohm resistor
10 kilohm resistor
10 kilohm potentiometer
10 ohm resistor
0.1 microfarad disc capacitor
10 microfarad electrolytic capacitor
220 microfarad electrolytic capacitor
100 microfarad electrolytic capacitor
Infrared phototransmitter
DPDT switch

Note: **PVE end plug schedule 40 may be found at any hardware store. All parts may be found at Radio Shack. (All resistors are 5 to 105 tolerance 1/4 watt. All capacitors are 10 to 20% tolerance, rated 35 volts or more).** For building instructions, look on page 185 of the LASER COOKBOOK. It will also be necessary to obtain some kind of project box to place both the transmitter and receiver. It should be made of some kind of sheet metal material so that it will shield out unwanted frequencies.

c. Burglar alarm
6" X 6" front surface mirror (Obtained from Edmund Scientific)
6" X 6" rear surface mirror (Ordinary mirror will do)
Modeler's clay
Masking tape
Spray bottle (plant mister will do)
Receiver from LED transmitter application
Mount for laser (built or bought. Lasers such as the Metrologic neon laser can be mounted on a small photographic tripod. Other lasers will have their own designs. If a mount is not supplied, simply prop the laser on a stack of books or magazines.)

d. Seismograph
6 inch sq. acrylic plastic base (Iasco plastics)
3 inch by 1/4 inch 20 carriage bolts, nuts, and washers (four).
Laser diode on heatsink (See diagram) (may be obtained from: DDK Tech.)
15 feet of jacketed fiber optic cable (Edmund Scientific)
Receiver from LED transmitter application
Connector for receiver diode
Connector or attachment for laser to fiber

e. Laser Modulation Test
4-6 inch circular wood or plastic embroidery hoop
4-6 inch full range speaker (deep taper)
3" X 3" pine block (for base and speaker mount)
2 corner brackets (see diagram)
Camera tripod
Receiver for LED transmitter application

Equipment/Machines/Tools

a. Safety goggles
b. Soldering irons (whatever you have available)

c. Hand tools
d. Glass cutter
e. Band saw
f. Circular saw
g. Jointer
h. Drill press

Handouts

See Appendix

Instructional Resources

Iannini, Robert E., FIBEROPTIC INFRARED AND LASER SPACE AGE PROJECTS. (Blue Ridge Summit, PA, TAB Books, 1987)

McComb, Gordon. LASER COOKBOOK. (Blue Ridge Summit, PA, TAB Books, 1987)

Management and Logistics

Related TAMS

Review the TAMs presented in the Missouri Power and Energy Technology Guide, 1990, for related TAMs.

Evaluation and Grading

a. Pre-test and post-test students.
b. Place a 60% emphasis on lab work and a 40% emphasis on written work.

Suggested Schedule

It is recommended that 2-3 weeks be spent on this portion of the communications class. However, depending on the type of class, more time can be spent on it.

Key Instructional Suggestions:

Safety

There are several other safety precautions that need to be observed such as solder iron safety, machine tools safety, etc. These should be covered in basic shop safety tests prior to implementation of this TAM.

Motivation

Laser Focus World magazine polled a number of human-resource specialists. All envisioned that the optics and laser field will continue to expand well into the future. It was noted that since the field is growing at such a fast rate, specialization in any one area would not be wise. They advise a broad-based knowledge of lasers and optics.

The average salary in the field of lasers and optics starts at about $20,000 for technicians and goes up over $100,000 for engineers, physicists, and marketing professionals.

This TAM just scratches the surface of laser use in society. With some research and work, lasers can be a fun and exciting part of your Industrial Technology curriculum.

Prerequisite information

A knowledge of the safe use of shop tools and successful completion of applicable safety tests.

Demonstration

a. Laser safety
b. Laser properties
c. Laser techniques
d. Working with the LED transmitter
e. Working with the burglar alarm
f. Detection of laser light (water particles)
g. Laser modulation

Reinforcement

There is an excellent opportunity for interaction with your science department. Seismology especially could fit in nicely with their curriculum content.

Attitudes

Due to the high cost of lasers and their peripheral devices, it is hoped that students will gain an appreciation of the tools and what they can do and realize the importance of precision and care when using these devices.

Remediation/Enrichment

Advanced students can actually construct the various devices needed for the activities. The remedial student may need to have the initial demonstrations repeated before doing the activities.

Review Questions

1. What part of your body is most susceptible to damage by the laser?
   ANS: THE RETINA OF THE EYE.

2. How do we prevent eye injury when working with the laser?
   ANS: BY FOLLOWING INSTRUCTIONS AND WEARING PROPER LASER SAFETY GOGGLES.

3. Define these terms:

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Beam
Coherence
Convergence
Divergence
Focal point
Frequency
HeNe
Laser
Monochromatic
Wave

4. What are the two disadvantages to using the laser?
ANS: BEAM IS EASILY OBSTRUCTED, AND SET-UP IS EASILY KNOCKED OUT OF POSITION.

5. What is the average starting pay for someone in the field of laser and optics?
ANS: $20,000.

Glossary

Amplitude: The relative strength (usually voltage) of an analog signal. Amplitude can be expressed as either a negative or positive number referenced to a particular standard.

Bandwidth: A continuous range of frequencies or wavelengths; defined by an upper and lower limit.

Beam: A collection of rays (light waves) moving in one direction.

Beam splitter: An optical component that divides a beam two or more different ways. Beam splitters are rated by the ratio of light they reflect and transmit.

Beam width: The linear width of the beam, usually specified as the region over which the beam intensity falls within predetermined limits.

Coherence: The property of identical phase and time relationships.

Concave lens: A type with at least one surface that curves inward.

Convergence: The bending of light by a lens or mirror to a common point.

Coverging lens: Generally, a lens that is thicker in the middle than the edges.

Convex lens: A type of lens with at least one surface that curves outward.

Diode laser: A solid -tate injection laser, similar to a light-emitting diode(LED).

Divergence: The bending of light rays away from each other; the spreading of light.

Diverging lens: Generally a lens that is thinner in the middle than the edges.

Fiber optic: A solid glass or plastic "tube" that conducts light along its length.

Filter: An optical component designed to block the passage of light at certain frequencies.

Focal length: The distance from the center of a lens or curved mirror to the point where light converges to a point. Lenses with a positive focal point cause the light rays to form at a specific point; lenses with a negative focal point only appear to diverge.

Focal point: That point in space where rays converge to a common point (positive lens system) or from which they appear to diverge (negative lens system)

Frequency: The repetition rate of an electromagnetic wave, whether light or an electric signal.

HeNe: Short for Helium Neon laser.

Laser: A mechanical device that produces intense, coherent radiation (mostly in the visible light and infrared regions). Laser is an acronym for light amplification by stimulated emission of radiation.

LED: Short for light-emitting diode, a unique type of semiconductor that is made to emit a bright beam of light.

Modulation: Altering the characteristic of a wave by imposing another wave on top of it. Often used to carry intelligent communication signals over electromagnetic (radio and light) waves.

Monochromatic: Possessing only one color, or more specifically, a specific wavelength (or a very restricted range) in the electromagnetic spectrum.

Objective lens: The lens used to focus a beam of light on a subject.

Photodetector: Any of a number of different types of electrical devices that are sensitive to visible light or infrared radiation.

Prism: An optical component ,usually in the form of a wedge, that redirects a light beam by diffraction and reflection.

Wave: An oscillation, in the form of a sine wave, of electromagnetic radiation through a medium (or through a vacuum).

Pre-Assessment:

Demonstrate to the students:

1. The color of the laser beam.
2. The size of the laser beam.
3. What happens when water is sprayed on the beam.
4. What happens as the laser is moved farther away from the cardboard

Review Questions

1. Why do you think the laser has a specific color?
2. What does the word laser stand for?
3. Why is the beam so small?
4. Why can we see the beam when we spray water on it?
5. How can we extend the distance the beam can travel?
6. Why do you think the laser is used in today's society?

Post-Assessment:

1. Figure the focal length of three different lenses.
2. Explain the effects of red and green filters on an HeNe laser.
3. Explain and demonstrate the difference between front and rear surface mirrors.
4. Demonstrate the use of a beam splitter.
5. Explain what it means to modulate a laser beam.
6. What is fiber optic cable? Name three uses for it.
7. What is diffraction, deflection, and diffusion?
8. Name the three characteristics of the laser beam.

Technology Activity Module 8

LASER

APPLICATIONS

by Craig Adams

Technology Activity Module 8

Student Component

Introduction:

Most people, when discussing laser communication, think of message transmission and reception via fiber optic cable. However, there are many different communication methods, fiber optics being one particular area.

In this TAM you will be working with 4 different laser applications. Only one of them will utilize fiber optics, the rest use free air transmission techniques.

Competencies:

1. Use safe procedures when using the laser.
2. Explain the importance of the role lasers play in our society.
3. Explain the importance of electrical communication, warning and sensing devices.
4. Correctly use terms associated with the laser and its use.
5. Give advantages and disadvantages of using the laser for communication systems.
6. Solve problems relating to the use of the laser in each activity.
7. Explain the impact lasers have made on the use of electrical communication, warning and sensing devices.

Module Overview:

Motivational statement

Lasers today are becoming more and more useful in society. And with that new found usefulness comes an opportunity for creative and industrious persons to fulfill many new occupational roles. It is hoped that this set of activities will not only teach, but also spark your interest in this interesting and exciting area of communications.

Relationship to Context

The use of lasers is becoming more and more important in many communication systems including the telephone, photography, and computers. You will see lasers used in many ways throughout your life including consumer products, the telephone system, hospitals, construction and manufacturing industries.

Key Information:

Class Presentations

a. Laser safety
b. What is a laser?
c. Laser characteristics
d. Coherent light
e. The helium neon laser
f. Other types of lasers
g. Laser applications
h. Laser occupations

Demonstrations

a. Laser safety
b. Laser properties
c. Laser techniques
d. Working with the LED transmitter
e. Working with the Burglar Alarm
f. Detection of laser light (water particles)
g. Laser modulation

Safety

Working with laser projects is both exciting and educational. But before you get started with any activity be sure to learn about the possible dangers. You could get hurt! Your instructor will be telling you how to avoid the danger of high voltage electrocution and the danger of light radiation, especially to your eyes.

The Center for Devices and Radiological Health (CDRH) has a strict set of laws regarding the use of commercially bought lasers. Lasers are sold depending on their power output, and it is the job of the CDRH to regulate those lasers and see that they comply with the standards to ensure that the dangers of laser radiation are kept to a minimum.

Follow all CDRH safety rules and those set up by your teacher before you begin work with lasers.

Most of the projects in this TAM will require some construction or electrical work. It is necessary that all shop safety precautions concerning the use of woodworking, metalworking, electronics, and plastics equipment as well as basic hand tool safety be observed.

Personal Activity

It is suggested that in addition to the material given by the instructor to support this activity, you should research the subject as much as possible. A list of resource materials can be obtained from your instructor.

Needed Materials:

Supplies

Ask your instructor for the following parts (All parts may be obtained a kit form through: DDK Technologies, 1007 N. College, Columbia, MO 65201).

a. LED Transmitter
- LM555 timer IC
- 100 kilohm potentiometer
- 10 kilohm resistor
- 0.1 microfarad electrolytic capacitor
- 33 microfarad electrolytic capacitor
- 0.0015 mica or Hi-Q disc capacitor
- Light emitting diode (high output)
- SPST switch
- Printed Circuit Board (diagram and schematic provided)
- PVC end plug schedule 40
- 1/8 inch miniature phone jack
- 1/8 inch miniature phone plug
- Knob for potentiometer
- 6 Volt DC battery holder
- 4 aa batteries

b. LED Receiver
- LM741 operational amplifier IC
- LM386 audio amplifier IC
- 220 kilohm resistor
- 1 kilohm resistor
- 10 kilohm resistor
- 10 kilohm potentiometer
- 10 ohm resistor
- 0.1 microfarad disc capacitor
- 10 microfarad electrolytic capacitor
- 220 microfarad electrolytic capacitor
- 100 microfarad electrolytic capacitor
- Infrared phototransmitter
- DPDT switch

(*Note:* PVC end plug schedule 40 maybe found at any hardware store. All parts may be found at Radio Shack. (all resistors are 5 to 105 tolerance 1/4 watt. All capacitors are 10 to 20% tolerance, rated 35 volts or more.)

For building instructions, look on page 185 of the LASER COOKBOOK. It will also be necessary to obtain some kind of project box in which to place both the transmitter and receiver. It should be made of some kind of sheet metal material so that it will shield out unwanted frequencies.

c. Burglar alarm
  6" X 6" front surface mirror (Obtained from Edmund Scientific)
  6" X 6" rear surface mirror (Ordinary mirror will do)
  Modelers clay
  Masking tape
  Spray bottle (plant mister will do)
  Receiver from LED Transmitter Application
  Mount for laser (built or bought. Lasers such as the Metrologic neon laser can be mounted on a small photographic tripod. Other lasers will have their own designs. If a mount is not supplied, simply prop the laser on a stack of books or magazines.)

d. Seismograph
  6" X 6" acrylic plastic base (Iasco plastics)
  Four 3 inch by 1/4 inch 20 carriage bolt, nuts, and washer.
  Laser diode on heatsink (See diagram) (from: DDK Technologies)
  15 feet of jacketed fiber optic cable (Edmund Scientific)
  Receiver from LED transmitter application
  Connector for receiver diode
  Connector or attachment for laser to fiber

e. Laser Modulation Test
  4-6 inch circular wood or plastic embroidery hoop
  4-6 inch full range speaker (deep taper)
  3" X 3" pine block (for base and speaker mount)
  2 corner brackets (see diagram)
  Camera tripod
  Receiver for LED transmitter application

Equipment/Machines/Tools

a. Safety glasses and goggles
b. Soldering irons
c. Hand tools
d. Glass cutter
e. Band saw
f. Circular saw
g. Jointer
h. Drill press

Handouts/Instructional Resources

Provided.

ACTIVITY SEQUENCE #1 **LED Transmitter and Receiver**

Start-up and instructions

Instructor will lecture on the following:

- Laser safety
- What is a laser?
    - Coherence
    - Monochromacity
    - Intensity
- Laser types
    - Gas
    - Semiconductor
    - Ruby
    - Etc...
- The laser as a communication link
    - Pros/Cons
    - Methods

Pre-Assessment

1. What is the difference between a concave and convex lense? (See Handout #1)

2. What is a transmitter? receiver? (See Handout #2)

3. Define frequency.

4. What happens when red and green light arw mixed?

5. What is the focal length of a lens? (See Handout #1)

Plan of Procedure

(Assuming the Transmitter and Receiver is already built)

Step 1

1. Test the Receiver by putting on headphones and listen for buzzing.

Step 2

1. Turn out room lights.
2. Turn on transmitter source (radio, tape player, etc..) and aim the transmitter LED at the receiver phototransistor.
3. Adjust control knobs until you hear a sound.

Step 3

1. Test the range of the unit by moving the receiver away from transmitter.
2. Try different colored filters to increase range.
3. Add the lens to increase range.

Post-Assessment

1. What does turning out the room lights do to the transmission of the LED light beam?

2. What is an LED?

3. What color filter extends the range the most? Why?

4. How do we determine focal length?

5. Which lenses would you use to extend the range of the transmitter the most?

6. Using the information learned on filters and lenses, try to extend the beam as far as you can.

ACTIVITY SEQUENCE #2 **Burglar Alarm**

Start-Up and Instructions

In this activity, either a laser or the LED transmitter may be used. Either way, the receiver may be used to complete the light beam "circuit". If you choose not to construct the LED receiver, a simple photographic light meter will work just fine. (See Handout #4)

It will also be necessary to have some kind of device to hold the mirrors in a stationary position. Included is a diagram of how to use an ordinary chalkboard eraser. If you place the mirrors on a vertical surface, use a heavy tape or some of the gum-like substance used to hang posters.

Pre-Assessment

1. How does a mirror work?

2. Why do you think we get 2 beams reflected when we shine the laser into a regular mirror?

3. What is diffraction?

Plan of Procedure

Step 1	1.	Either mount the laser on a base or simply set it on a table or other smooth surface.
	2.	Mount mirrors in either a chalkboard eraser or a constructed device to ensure that it does not move.
	3.	With the lights off, position the mirrors in such a way that the laser light bounces off each mirror continually until it strikes the receiver.
Step 2	1.	With the room lights off try to negotiate the individual beams so that receiver does not detect the movement.
Step 3	1.	Obtain a spray bottle with water in it and spray the laser beams.
	2.	Try to penetrate the laser beams without tripping the alarm.
Step 4	1.	Attach a beam splitter made of reflective mylar and refocus the beams. It will be necessary to use another receiver.
	2.	Try to penetrate again.

Post-Assessment

1. Explain the difference between front and rear surface reflective mirrors.

2. Why is it so difficult to align the mirrors to strike a specific spot?

3. When you spray the water mist on the beam, why do you see the beam?

4. What does the beam splitter do?

5. Using what you have learned up to this point, set up a burglar alarm that has at least 2 beams from 1 laser and try to extend the beams as far as possible to form an alarm. Try to penetrate the alarm without detection.

ACTIVITY SEQUENCE #3 **Acoustic Modulation**

Start-Up and Instructions

Five years after the invention of the telephone, Alexander Graham Bell invented what he thought would be an even bigger success. He called it the photophone. Its operation was very simple. A membrane, made of mylar,was used to vibrate when a person talked into it, while a bright beam of light was pointed at the membrane and bounced back to a receiver. As the membrane modulated the voice vibrations, the receiver demodulated the light back into the talker's voice.

In the activity you will construct Mr. Bell's experiment, adding the laser in as a high-tech improvement. You can use previously used techniques from the other activities to increase range and number of receiver beams. Also the receiver and transmitter from LED activity will work very well.

Pre-Assessment

(none)

Plan of Procedure

Step 1
1.Obtain a piece of reflective mylar from your instructor.
2. Obtain the hoop assembly and stretch mylar over the hoop and attach. It is important that you stretch the mylar very tightly. (See Handout #5)
3. Place the speaker on the base assembly and mount it behind the mylar.

Step 2
1. Activate the radio or tape player etc...to oscillate the mylar.
2. Bounce the light source off the mylar.
3. At the receiver you should hear the demodulated input sound.

Post-Assessment

(none)

ACTIVITY SEQUENCE #4 **Seismograph**

257

Start-Up and Instructions

Instructor should lecture on:
Earthquakes
Plate tectonics
The Richter scale
Seismographs and how they work

The detection of earthquakes has been and will continue to be a concern of society for many years to come. With the recent disasters in Armenia and San Francisco, there has been a growing awareness in our society of the importance of being prepared for earth quakes. This activity is a working model of a seismograph that you can install in your shop to detect movements. With the New Madrid fault right here in Missouri, you could , considering what area you live in, be detecting large or small earthquakes in our own back yard. And with the use of the computer, you can keep detailed documentation of each series of tests you take.

Pre-Assessment

1. What is the Richter scale?

2. Define these terms:
   fault-
   epicenter-
   seismograph-

3. What is fiber optics?

Plan of Procedure

Step 1 — 1. Since our seismograph works on vibrations (See Handout #6), it is important to dampen out the vibes caused by other sources. Place the seismograph away from things that cause vibrations not wanted to test, like shop machinery. It should be placed either on firm ground, a cement floor or anything that is stationary and stable.

Step 2 — 1. Test the seismograph by turning on the laser and shining it onto the input plug of the fiber optic cable.
2. Hook the output of the amplifier to the speaker or headphones (you should hear a hiss when vibrated).
3. Adjust the control knob for best sound.

Step 3 — 1. If you have a Commodore 64, you can connect this machine to the computer and collect data (instructions included). Computer interface for the IBM or Apple does not exist yet.

Post-Assessment

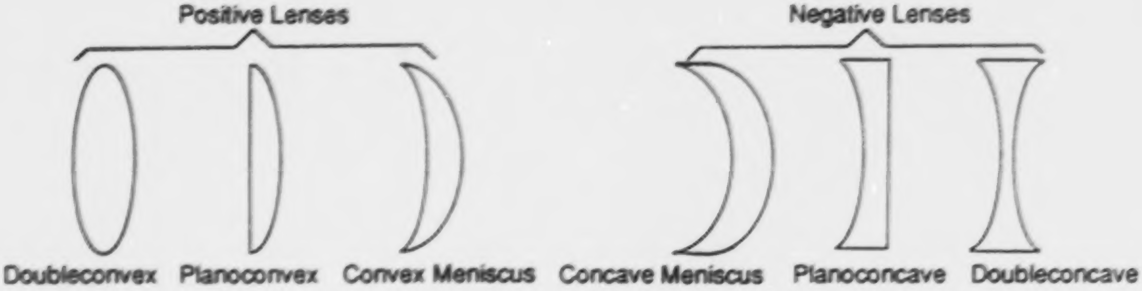
1. What evidence can you show to suggest that there is vibration or even earth quake movement below your school building?

Summary and Wrap-up:

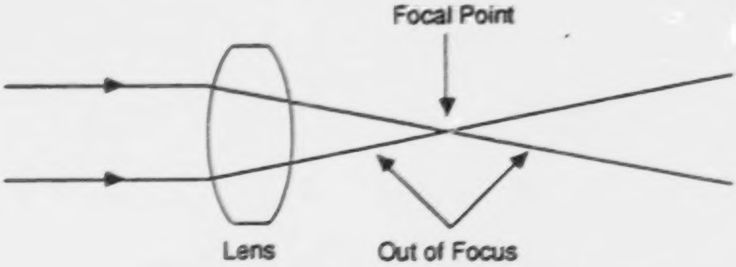
Laser technology is fun and exciting. But it can also be very dangerous; theses tools can harm you if used incorrectly. In this TAM many laser concepts were illustrated through model building activities. In the future lasers will be applied to more and more fields of work. Skilled technicians will be needed in the area of laser technology.

APPENDIX I See following pages.

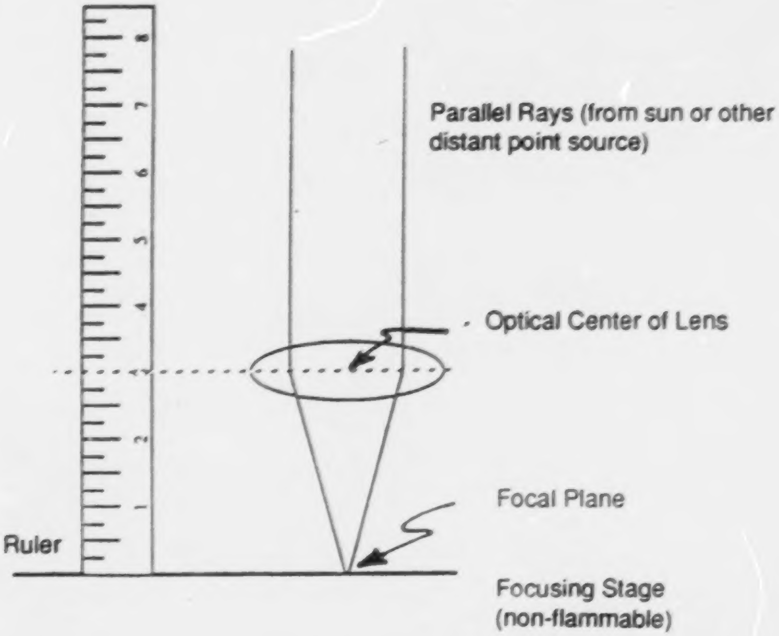
Handout #1: How Lenses Work


Positive Lenses
Negative Lenses
Doubleconvex
Planoconvex
Convex Meniscus
Concave Meniscus
Planoconcave
Doubleconcave

Six Major Types of Lenses

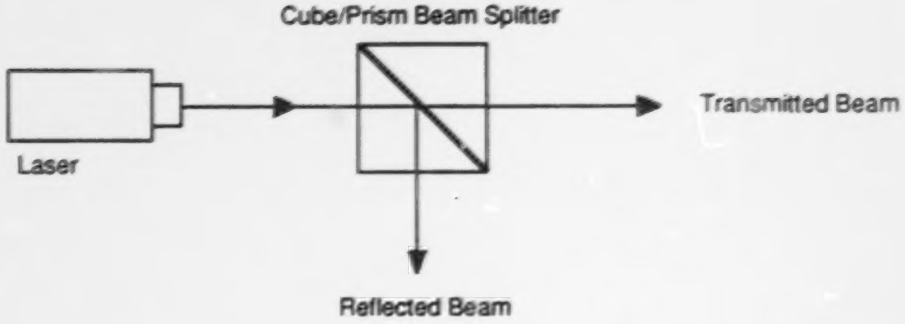

Focal Point
Lens
Out of Focus

Positive lenses are used to focus light to a point.


Ruler
1
2
3
4
5
6
7
8
Parallel Rays (from sun or other distant point source)
Optical Center of Lens
Focal Plane
Focusing Stage (non-flammable)

Focal Length: Distance from optical center of lens to the focal plane.

Handout #1: How Lenses Work (Continued)


Cube/Prism Beam Splitter
Transmitted Beam
Laser
Reflected Beam

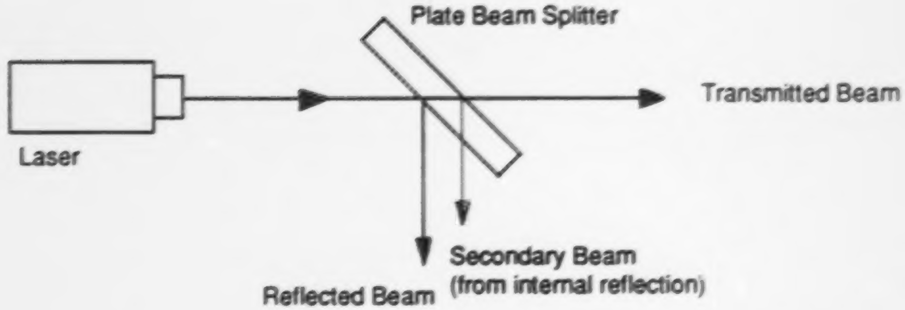
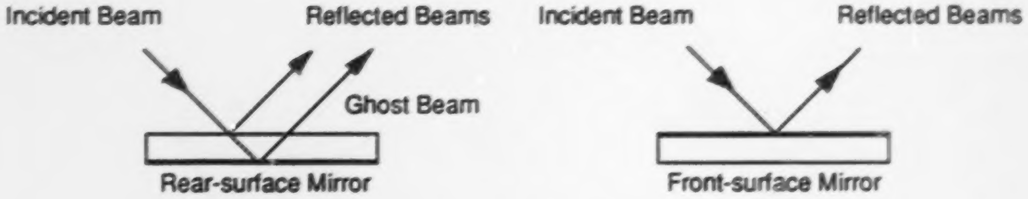
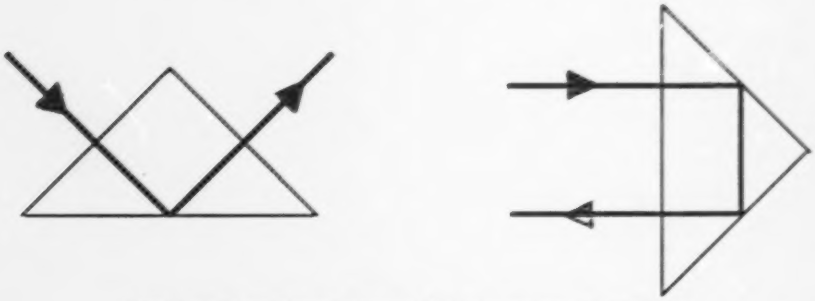


Plate Beam Splitter
Transmitted Beam
Laser
Secondary Beam
(from internal reflection)
Reflected Beam


Incident Beam
Reflected Beams
Ghost Beam
Rear-surface Mirror
Incident Beam
Reflected Beams
Front-surface Mirror

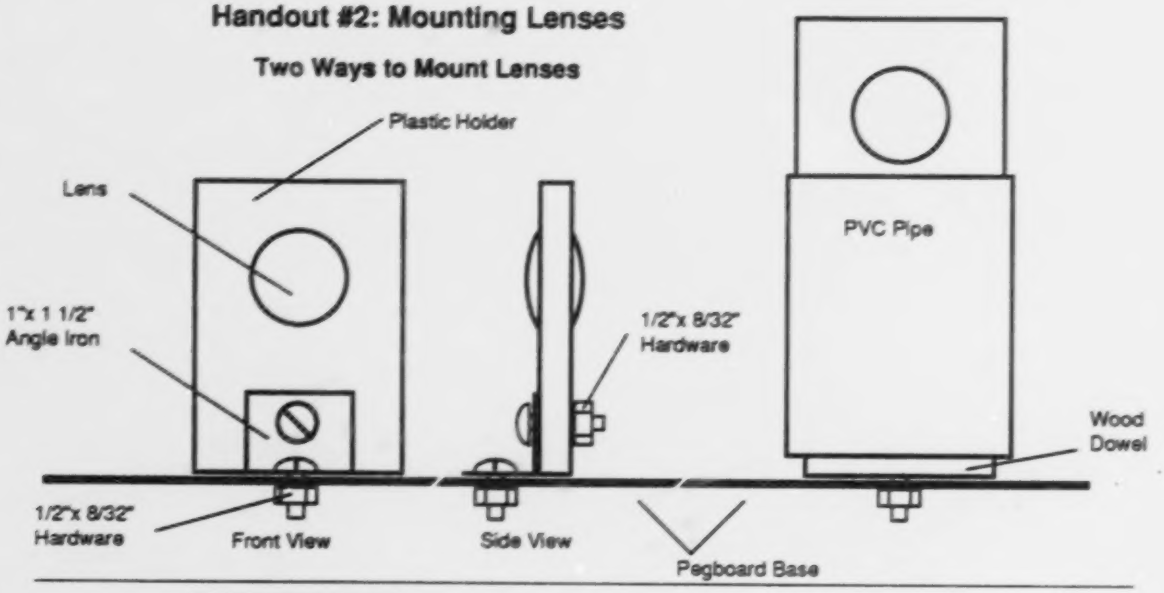
Rear-surface mirror creates a ghost beam; a front-surface mirror only reflects one beam as shown.

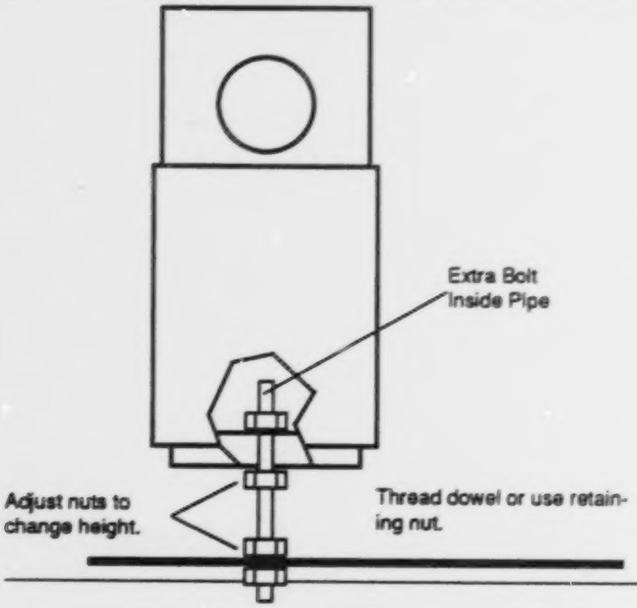


Right angle prisms direct light in several patterns.

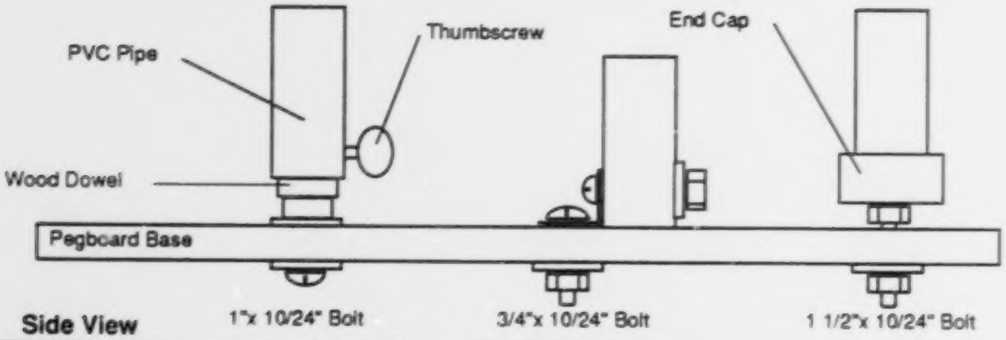
Handout #2: Mounting Lenses

Two Ways to Mount Lenses


Plastic Holder
Lens
1"x 1 1/2" Angle Iron
1/2"x 8/32" Hardware
Front View
Side View
1/2"x 8/32" Hardware
PVC Pipe
Wood Dowel
Pegboard Base

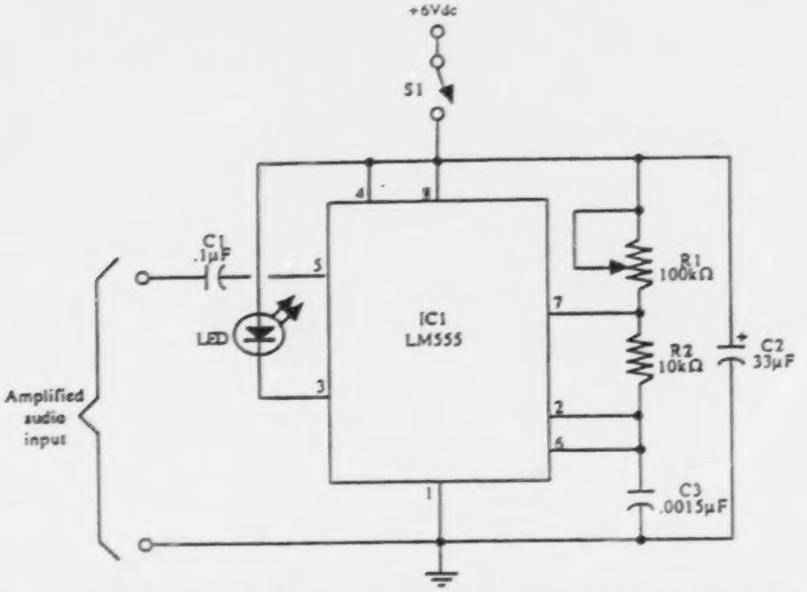

Extra Bolt Inside Pipe
Adjust nuts to change height.
Thread dowel or use retaining nut.

Height Adjustment Technique


PVC Pipe
Thumbscrew
End Cap
Wood Dowel
Pegboard Base
1"x 10/24" Bolt
3/4"x 10/24" Bolt
1 1/2"x 10/24" Bolt

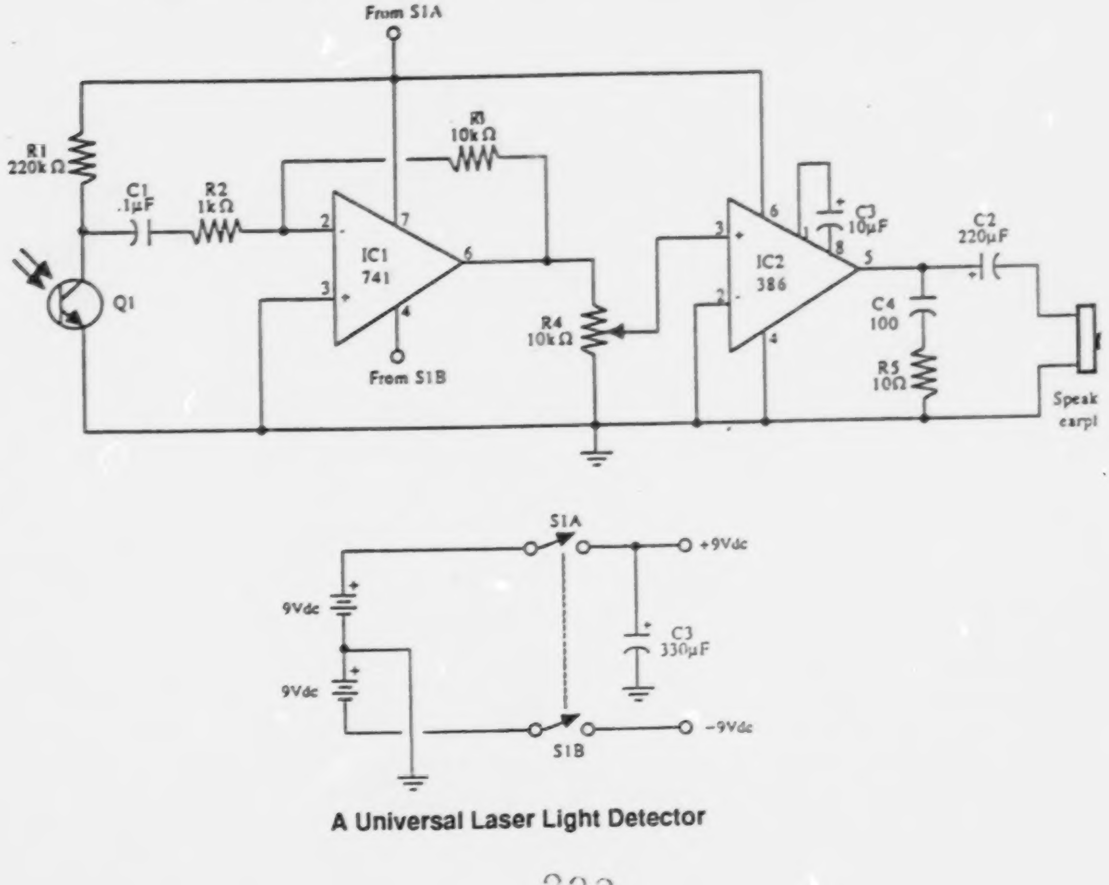
Side View

Handout #3: Schematic Diagrams



+6Vdc
S1
4
8
C1
.1μF
5
LED
3
IC1
LM555
7
2
6
1
R1
100kΩ
R2
10kΩ
C2
33μF
C3
.0015μF
Amplified
audio
input

Schematic Drawing of a Pulse Frequency Modulating LED Transmitter

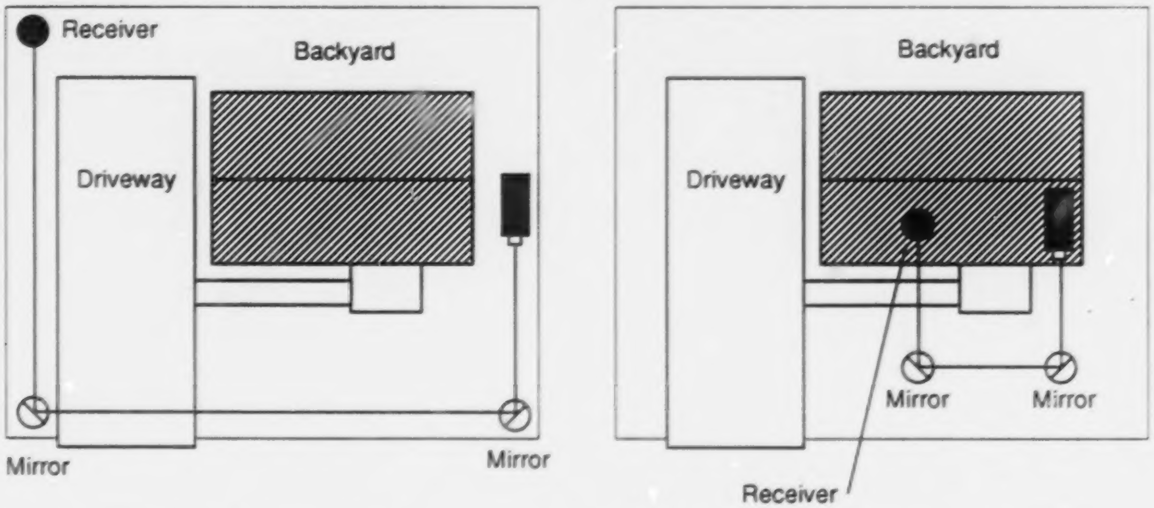


From S1A
R1
220kΩ
C1
.1μF
R2
1kΩ
R3
10kΩ
2
3
7
4
6
IC1
741
From S1B
Q1
R4
10kΩ
IC2
386
3
2
6
1
8
5
4
C3
10μF
C2
220μF
C4
100
R5
10Ω
Speak
earpl
S1A
+9Vdc
9Vdc
9Vdc
C3
330μF
S1B
-9Vdc

A Universal Laser Light Detector

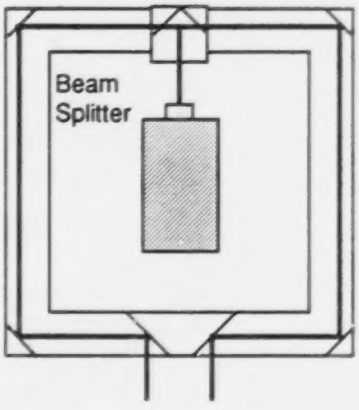
Handout #4: Two Ways to Build a Break-beam Laser Alarm System

Top View of Home Burglar Alarm System

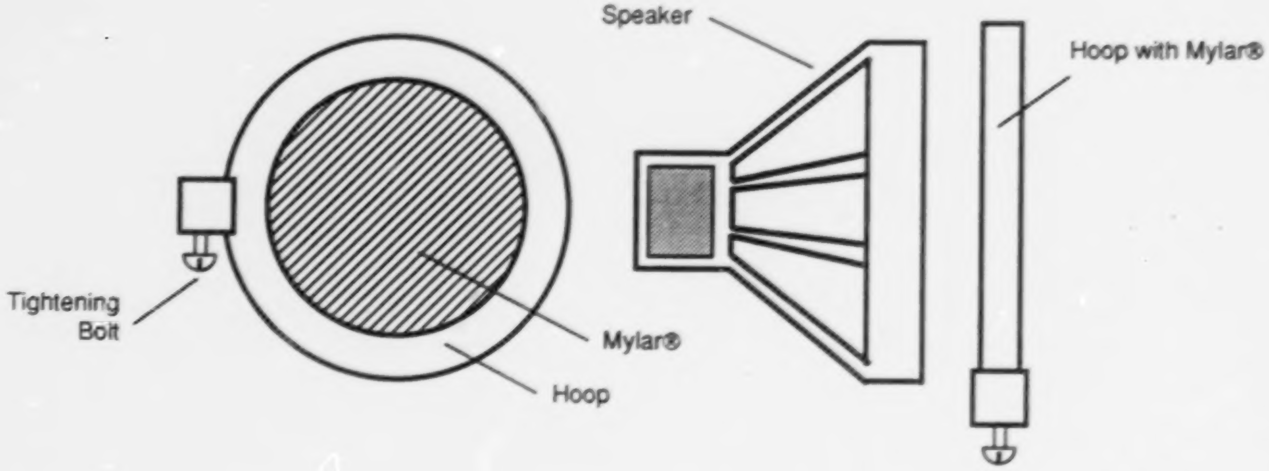

Receiver
Backyard
Driveway
Mirror
Mirror
Backyard
Driveway
Mirror
Mirror
Receiver

Front/side yard/driveway protection (backyard is fenced)

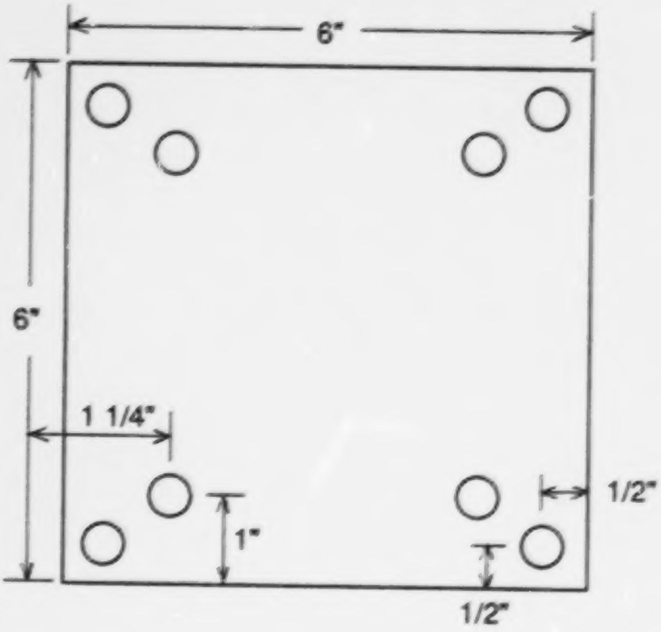
Front door protection (laser and receiver are inside house; beam is shined through window)

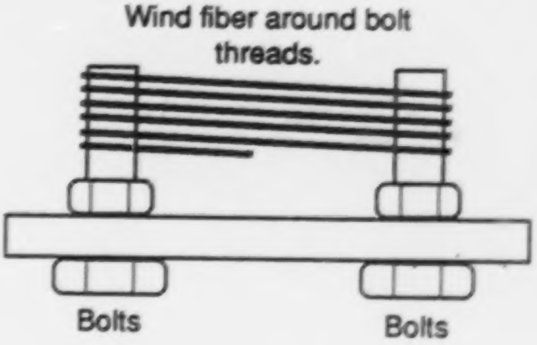

Beam Splitter
To Sensor 1
To Sensor 2

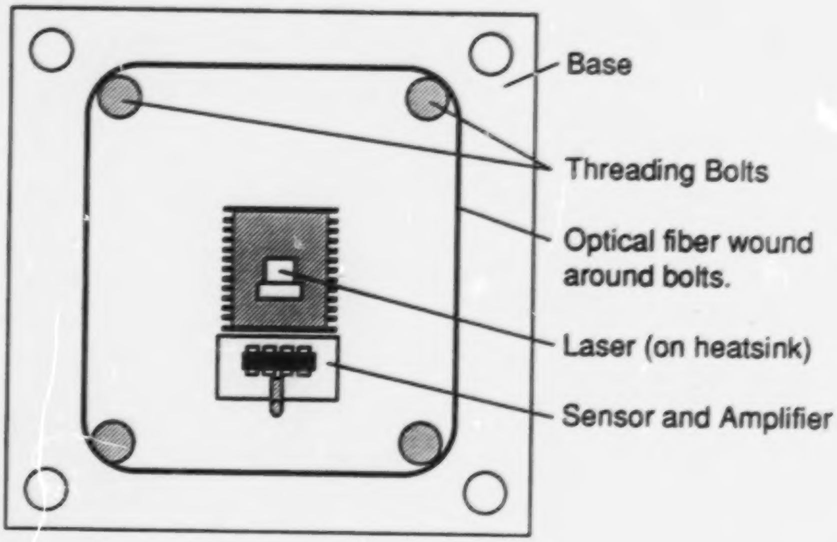
Handout #5: Basic Construction of a Mylar® Speaker Modulator


Speaker
Hoop with Mylar®
Tightening Bolt
Mylar®
Hoop

Handout #6: Layout of the Fiber, Laser, and Sensor Board on the Seismograph Base


6"
6"
1 1/4"
1"
1/2"
1/2"


Wind fiber around bolt threads.
Bolts
Bolts


Base
Threading Bolts
Optical fiber wound around bolts.
Laser (on heatsink)
Sensor and Amplifier

Technology Activity Module 9

FIBER OPTICS

THE NEW RAYS

by Don Costello

Instructor Component

Activity Objectives:

Introduce this exciting technology of optic fibers to your students. Explain how fibers are affected by light and how the fibers are produced. The activities included here will give your students different uses for fiber optics, from simple to complex.

Target Competencies:

1. Explain the characteristics of light.
2. List the colors of the visible light spectrum.
3. List and explain optic components and the effect they have on a beam of light.
4. Describe how optic fibers are manufactured.
5. List the type of optic fiber and explain how they are constructed to produce fiber optic cables.
6. Differentiate between LED fiber optic and LED laser diodes.
7. Report on the performance of a photodetector cell in receiving a light source from fiber optics.
8. Describe the different types of fiber optic communication systems.
9. Send a message via a simple fiber optic system.

TAM Instructions: Introduction:

This module was written to inform the student and the instructor about the emerging technology of optic fibers. The topic is introduced through the discussion of light and the effect of mirrors and lenses, the optic fibers themselves, the light source traveling through the fibers, and the receivers and the uses of fiber optics. The emphasis of this TAM will be the how's, why's and what for's of fiber optic systems.

Safety Considerations

Two key safety considerations when working with fiber optic systems:

1. NEVER aim a laser beam at another person
2. Caution should be used when working with glass fibers so they do not splinter off in your skin.

Needed Materials:

Supplies

a. 1-flashlight with batteries
b. 1-plastic plumbing cap (to fit bulb side of flashlight)
c. 1-18" X 1/4" clear acrylic rod
d. Epoxy

Equipment/Machines/Tools

a. drill press
b. center jig
c. drill bit

Handouts

a. plan of procedure
b. morse code

Instructional Resources

a. Catalogs:
Kelvin Electronics
#7 Fair Child Ave.
Plainview, NY 11803

Creative Learning Systems Inc.
9899 Hibert St.
Suite C
San Diego, CA 92131

Michigan I.A./Technology Curriculum
Laser Technology

Heath Zenith Company
Benton Harbor, Michigan 49022

b. Books:

Hecht, Jeff, UNDERSTANDING FIBER OPTICS, (Indianapolis, IN. Howard W. Sams Co., Division of MacMillan, 1987) The latest communications applications are highlighted including, telephone, computer, LAN, video, and automotive (available from Kelvin Electronics).

FIBER OPTICS INDIVIDUAL LEARNING PROGRAM (Heath Kit Ed System # EE 4201) (Benton Harbor, MI, Heath Zenith Co.) This course is designed to present an in depth introduction to the interesting and challenging field of fiber optics.

Electronics Magazine (May, July, & Aug. '89) This series will give you a means of developing your own light communicator-receiver.

Kuecker, John A., FIBER OPTICS: REVOLUTION IN COMMUNICATION, (Blue Ridge Summit, PA. ,Tab Books, 1987) Includes a wealth of information on wave propagation, detectors, fiber optic wave guiding, speech digitizing and the new transatlantic fiber optic cable (from Creative Learning Systems).

Boyd, Waldo, FIBER OPTICS (Indianapolis, IN., Howard W. Sams Co., Division of MacMillan, 1982) Eight preliminary experiments illustrate the potential of the medium and prepare student to build transmitters, receivers, cables, and light pens (from Creative Learning Systems).

Safford, Edward, Jr. THE FIBER OPTIC AND LASER HANDBOOK (Blue Ridge Summit, PA, Tab Books, 1988) This source book presents the latest applications of lasers, fiber optics, and electromagnetic radiations in state-of-the-art detail (from Creative Learning Systems).

c. Field Trips:

Local telephone company
McDonnell Douglas

Management and Logistics
Related TAMS

TAM: Laser Applications

Evaluation and Grading

This can be accomplished through a successful send and receive message or with completion of the pretests and posttests.

Suggested Schedule

Depending on how much you would like to include, this unit could run from 3 days to 2 weeks.

Key Instructional Suggestions

Safety

If a laser is used, DO NOT aim the light beam into the eyes of humans or animals.

Motivation

Explain to students how fiber is used in the telephone system and how it will soon bring different types of information to their homes. Ask them if they knew that fiber optic strands connect St. Louis and Kansas City, and that there is a cable under the Atlantic on the ocean floor. Also, ask a manager of your local phone system for a sample of real optic cable.

Prerequisite information

Fiber optic transmission of light pulses is an emerging communication technology. To teach about it requires a healthy curiosity and a willingness to try new things. Review the information about fiber optics in the recommended resources on the previous page.

Demonstration

Demonstrate the use of Morse code and, if possible, demonstrate the difference between conventional and optical phone cable.

Reinforcement

a. Solicit a guest speaker from the local telephone company or AT&T.
b. Do a laser demonstration with and without optic cable.
c. Plan a discussion of conventional and optic cable.

Attitudes

Working relationships and problem solving skills will be strengthened in this TAM.

Remediation/Enrichment

a. Make a simple fiber optic system and send a message.
b. Make an electronic modulator and demodulator and send information back and forth (see Electronics Magazine listed in resource section)

Summary and Review

Although the activity that is part of this TAM is rather simple it will give the students a basic idea about fiber optic communications. If an instructor would like to follow up with a more sophisticated system, it would give the students a better feel of how a true fiber optic system would work.

Review Questions

1. List the parts of a fiber optic system.

2. List materials optic fibers are made from.

3. What is the use of the photodetector in a fiber optic system?

4. What produces laser light?

5. How does air affect light before it is passed through an optic fiber?

6. Optical fibers are immune to what type of interference?

Glossary

Ambient Light - Light present in the immediate environment.

Cladding - A sheathing or covering usually of glass or plastic, fused to the core of higher indexed material.

Coherent - Characterized by a fixed phase relationship between points on an electromagnetic wave.

Diode - A two-electrode device with an anode and a cathode that passes current in only one direction. It may be an electron tube or semiconductor device.

Incoherent Light - Light made up principally of nonparallel rays and lacking a fixed phase relationship.

Laser - Light amplification by stimulated emission of radiation.

Light Emitting Diode (LED) - A semiconductor device that emits incoherent optical radiation when biased in the forward direction.

Microbending - Sharp curvatures involving local axial displacements of a few millimeters. Microbending may cause significant radiative losses.

Optical Fiber - Any filament or fiber, made of dielectric materials, that guides light, whether or not it is used to transmit signals.

Rays - Straight lines that represent the path taken by light.

Threshold Current - The driving current corresponding to lasting threshold.

Pre-Assessment:

1. Optical fibers are made of:
   a. glass coated with plastic.
   b. ultrapure glass.
   c. plastic.
   d. all of these above.

2. Essential components of any fiber-optic communication system are:
   a. light source, fiber, and receiver.
   b. light source and cable.
   c. fiber and receiver.
   d. fiber only.

3. Unlike wires, optical fibers are immune to:
   a. Electromagnetic interference.
   b. high-frequency transmission.
   c. signal losses.

4. Application of fiber-optic communications include:
   a. ocean-spanning underwater cables.
   b. long-distance telephone transmission on land.
   c. connecting telephone-company facilities.
   d. all of the above.

5. If light passes from air into glass, it is called:
   a. reflected.
   b. refracted.
   c. absorbed.
   d. scattered.

6. Light is confined within the core of a simple optical-fiber by:
   a. refraction.
   b. total internal reflection at the outer edge of the cladding.
   c. total internal reflection at the core-cladding boundary.
   d. reflection from the fiber's plastic coating.

7. What part of the telephone network is connected directly to your home telephone?
   a. subscriber loop.
   b. feeder cable.
   c. trunk line.
   d. backbone system.

8. Which of the following is not an advantage of fiber optics for telephone transmission?
   a. Will not propagate current pulses from lighting strikes.
   b. High quality analog transmission.
   c. Small sizes lets four fiber cables fit in ducts that could hold only one metal cable.
   d. Immunity to electromagnetic interference.
   e. Long-distance high-speed transmission.

9. Light emission from an LED is modulated by:
   a. voltage applied across the diode.
   b. current passing through the diode.
   c. illuminating of the diode.
   d. all of the above.

10. Which of the following statements about the differences between semiconductor lasers and LEDs are true?
    a. lasers emit higher power at the same drive current.
    b. lasers emit light only if drive current is above a threshold value.
    c. output from LEDs spreads out over a broader angle.
    d. LEDs do not have reflective end facets.
    e. all of the above.

11. Laser light is produced by:
    a. stimulated emission.
    b. spontaneous emission.
    c. black magic.
    d. electricity.

12. What is the main difference between an analog and a digital receiver?
    a. special amplification circuitry.
    b. the presence of decision circuitry to distinguish between on and off signal levels.
    c. the two are completely different.
    d. digital receivers are free from distortion.

13. The fastest photodetectors have response times of:
    a. a microsecond
    b. hundreds of nanoseconds.
    c. a few nanoseconds.
    d. under a nanosecond.

14. What is the most important attraction of fiber optics for cable-television trunk systems?
    a. lowest cost per channel.
    b. best signal-to-noise ratio.
    c. most immune to interference.
    d. best able to connect many nodes.

15. A LAN is:
    a. a system that interconnects many nodes by making all signals pass through a central node.
    b. a ring network with a transmission medium that passes through all nodes.
    c. a common transmission medium or data bus to which all nodes are connected but that does not form a complete ring.
    d. all of the above.
    e. none of the above.

16. How are optical fibers used in cars?
    a. to transmit control signals to power-windows.
    b. to indicate whether bulbs are operating.
    c. to transmit power to windshield washers.
    d. to provide noise-free transmission of stereo programs.

17. Endoscopes used in medicine to view inside the body are:
    a. flexible fiber-optic bundles.
    b. also able to transmit laser beams to treat disease.
    c. rigid fiber-optic bundles.
    d. all of the above.
    e. none of the above.

ANSWERS TO PRE-POST TEST

1. D
2. A
3. A
4. D
5. B
6. C
7. D
8. B
9. B
10. E
11. A
12. B
13. E
14. D
15. D
16. B
17. D

Technology Activity Module 9

FIBER OPTICS

THE NEW RAYS

by Don Costello

Student Component

Introduction:

In this TAM you will learn how fiber optics are made and used. You will experience a simple form of communication with an optic fiber. You will discuss how fiber optics are used by telephone companies. If a laser set-up is available fiber optics can be demonstrated with even greater sophistication.

Competencies:

By the time you are done with this TAM you should be able to:

1. List the colors of the visible spectrum.
2. Describe how optic fiber is manufactured.
3. List the types of fiber optic cables.
4. Assemble a simple form of a fiber optic communicator.
5. Send a message by fiber optics using morse code.

Module Overview:

Motivational statement

Fiber optics is a new communication technology. Pulses of light are sent through thin glass fibers. After they are installed, usually underground, this transmission system can pass information from one point to another almost instantaneously. In the future, you will receive these light pulses at home traveling at the speed of light , to activate your T.V. (High Definition Television), stereo speakers and long distance phone calls, maybe even some that cross the Atlantic ocean!

Relationship to Context

Fiber optics represents a break-through in transmission technology. Optic fibers are less expensive and more efficient than copper wires for carrying information. In the future most telephone calls will be routed over fiber cables. And if you "telecommunicate" with a personal computer, fiber optic cables are perfect for carrying its digital signals.(Also see TAM: Laser Applications.)

Key Instructional Suggestions:

Class Presentations

The instructor will explain how light effects the optical fibers, how fibers are produced, and the history of how they were invented.

Demonstrations

The instructor's demonstrations will let you see first hand how fiber optics are used in today's world of technology.

Safety

1. DO NOT look directly into the light source.
2. When working with glass fiber optics caution needs to be encouraged that the fibers don't splinter into your hand.

Personal Activity

In this TAM you will make a simple fiber optics communication system. Then, you will send and receive a message using morse code. Look in your local library for an article about fiber optics. Read it; you'll be amazed.

Needed Materials:

Supplies

- 1 flash light with batteries
- 1 plumbing cap to fit end of flash light
- 1 20" X 1/4" clear acrylic rod
- epoxy

Equipment /Machines/Tools

- drill press
- drill bit 1/4"
- center jig

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Handouts/Instructional Resources

- Morse code

Activity Sequence:

Instructional start-up & instructions

Observe the instructor's demonstrations on how to construct the fiber optic communicator, and how to encode, send and decode morse code.

Pre-Assessment:

Complete the pretest before attempting the activity below.

Plan of Procedure

a. Build the communicator; encode and send a message
    1. Find center of plumbing cap and mark.
    2. Drill hole in center of plumbing cap using 1/4" bit
    3. Polish both ends of acrylic rod.
    4. Install and epoxy cap to flash light.
    5. Install and epoxy rod in cap being careful not to get epoxy on end of rod.
    6. Write a short message to send.
    7. Encode the message into dots and dashes (Morse code).
    8. Using fiber optic communicator send message.

b. To receive a message
    1. As light flashes at end of fiber optic communicator record long or short dashes on paper.
    2. Decode morse code to a written English message

Post-Assessment:

1. Complete the "self-check" (see post-test self-check) on the completion of sending and receiving a message with a simple fiber optic system.
2. Have the instructor complete the evaluation and discuss any discrepancies between the two assessments.
3. Complete the post-test for this TAM.
4. If your results demonstrate mastery, go on to the next TAM or activity assigned by your instructor. If less than completely successful, see your instructor and plan what to do to raise your level of mastery.

Post-test Self-check

1. Message coded into morse code.
2. Message sent through fiber optic simulator.
3. Message received by fiber optic simulator.
4. Message decoded using morse code handout.

Summary and Wrap-up

The purpose of this activity was to discuss and experience the component parts of a simple fiber optic system. These included the optic fiber, it's light source, a receiver and code. In the future, everyone will use and be affected by the "new rays" of fiber optic communication systems.

MORSE CODE

A .-
B -...
C -.-.
D -..
E .
F ..-.
G --.
H ....
I ..
J .---
K -.-
L .-..
M --
N -.
O ---
P .--.
Q --.-
R .-.
S ...
T -
U ..-
V ...-
W .--
X -..-
Y -.--
Z --..

Technology Activity Module 10

INTERCOM
SYSTEM

by Ed Carter

Instructor Component

Activity Objectives:

The purpose of this TAM is to demonstrate the proper procedure in constructing and testing the operation of a basic intercom system.

Target Competencies:

By completing this TAM the student will be able to:

1. Explain the operation of a basic intercom system
2. Recognize electronic components used in a basic intercom and associate them with schematic symbols.
3. Construct an intercom circuit from a schematic and pictorial diagram.
4. Demonstrate proper techniques for testing an intercom system.

TAM Instructions
Introduction

This activity is designed to familiarize the students with the procedure used in constructing and operating a two station intercom system. The student will construct half of the system on one solderless breadboard and the other half of the system on another breadboard. This may be accomplished by two students, each constructing half of the system.

Safety Considerations

The use of safety glasses when cutting wire is required to prevent small pieces of wire from hitting some one in the eye. Also be aware of possible puncture wounds resulting from wire ends.

Needed Materials:

Supplies Required

(2 of each of the following items are needed for a two-way intercom system)
a. 9 volt battery
b. 9 volt battery terminal
c. LM386 Integrated Circuit (amplifier)
d. SPDT switch
e. 0.005 uF capacitor
f. 0.047 uF capacitor
g. 4.7 uF capacitor, 16 DCWV
h. 10 uF capacitor, 16 DCWV
i. 220 uF capacitor, 16 DCWV
j. 15 ohm resistor, 1/4 watt
k. speaker (at least 4" diameter)
l. wire, 22-24 gauge, solid conductor (1 ft)
m. wire, 22 gauge, stranded or solid conductor (length determined by distance between stations--3 wires will be required.)

Equipment/Machines/Tools

a. wire cutters/stripper
b. solderless circuit board (any size)
c. long nose pliers

Handouts

Student component of TAM

Instructional Resources

a. Books:
Drugger and Gerrish, TRANSISTOR ELECTRONICS (South Holland, Ill., Goodheart-Wilcox Co. Inc., 1981)

b. Parts can be ordered from:
Kelvin Electronics
7 Fairchild Ave.
Plain View, NY 11803

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Management and Logistics
Related TAMS

This Tam could be used in conjunction with the TAM: Home Security Monitoring Systems.

Evaluation and Grading

It recommended that two students construct the intercom system with each student constructing one station. Successful completion of the project will be accomplished when each student's intercom can transmit and receive voice communications. Additional grading points may be given for parts placement (neatness) on the solderless breadboard.

Suggested Schedule

Five class periods consisting of four lectures: (1)"How speakers operate." 2. "Basic operation of an intercom system." 3. Component identification. 4. Circuit construction and an 5. Evaluation and Summary.

Key Instructional Suggestions:

Safety

Brief students on the use of wire strippers/cutters and how to prevent flying pieces of wire. Stress the use of safety glasses.

Motivation

Students can build the circuit for less than five dollars. A working system could be installed in their basement as a communicating device to another area of the home.

Prerequisite information

a. Students should have some solderless breadboard skills.
b. Students should know how to use associated tools safely.

Demonstration

A working model of the intercom system may give the student an example of the expected results.

Reinforcement

Verbally praise students as they make progress at the assembly of the component parts.

Attitudes

Encourage students to develop an attitude of precision. A technical communication system works only if every required part is precisely placed and connected into the circuit.

Remediation/Enrichment

Some students will finish the unit before others. Have these students assist the students who are slower.

Summary and Review

a. Understand the operation of dynamic speakers and an intercom system.
b. Identify electronic components in a basic intercom system.
c. Construct and operate an intercom system.

Review Questions

1. Why is care necessary when installing electrolytic capacitors?
   Electrolytic capacitors are polarized and may explode if connected wrong.

2. Why is care necessary when cutting hook-up wires?
   When cut, wire sometimes flies through the air and may injure some one.

3. How do dynamic speakers change sound waves to electrical waves?
   A coil of wire is attached to the flexible cone of the speaker. The coil is suspended between a permanent magnet. When sound waves are applied to the speaker cone, the cone vibrates causing the coil to move back and forth in the magnetic field . This causes a voltage to be induced at the rate of the applied sound waves.

4. What are the basic components of an intercom system?
   Speakers, amplifier circuit, power and a switch.

5. Why is the proper connection of the battery important?
   Electronic components may be damaged.

Glossary

Audio Amplifier- used to amplify audio frequencies.

Dynamic Speaker- speaker which produces sound as a result of reaction between a fixed magnetic field and the fluctuating field of a voice coil.

Intercom System- two way electronic communicating device.

Voice Coil- small coil attached to the speaker cone.

Oscillation- a flow of electricity changing periodically form maximum to minimun.

Gain- the ratio of increase of output over input in an amplifier.

Pre-Assessment:

If after verbally quizzing the students and you find that they do not know how to use solderless breadboards, basic hand tools or safety procedures, design several additional activities to bring them up to your requirements.

Post-Assessment:

1. Which of the following devices are NOT part of an intercom system?
    - a. speaker
    - b. amplifier
    - c. switching device
    - d. oscillator

2. An intercom system is a system that provides:
    - a. two-way communication
    - b. only one-way communication
    - c. high voltage
    - d. high current

3. Points for completion of project:
    - a. safety procedures observed.............. _______________
    - b. system can transmit and receive......... _______________
    - c. Neatness.................................... _______________

Review Question Answers

Key to Post-assessment
1. D.
2. A.

Technology Activity Module 10

INTERCOM
SYSTEM

by Ed Carter

Student Component
Introduction:

In this TAM we will construct and test a basic intercom system. This activity will give you experience in identifying and wiring electronic components to perform a communication function.

Competencies:

Upon completion of this TAM you will be able to :

1. Explain the operation of a basic intercom system.
2. Recognize electronic components used in a basic intercom and associate them with schematic symbols.
3. Construct an intercom circuit form a schematic and pictorial diagram.
4. Demonstrate proper techniques for testing an intercom system.

Module Overview:

Motivational statement

By constructing this circuit you can install a communication system in your home. It is a good device to assist your family in calling you in your room from another part of the house without yelling. It can be constructed at a very low cost. Have fun building and testing it!

Relationship to Context

This TAM presents an example of a hard-wired transmission/reception system. Other systems may use light or radio frequency transmissions.

Key Instructional Suggestions:

Class Presentations

1. Basic intercom system operation.

a. The basic intercom system consists of two stations, with each station consisting of a dynamic speaker, a switching device, an amplifying device, and three conductors (wires) for transmitting and receiving voice communications. A basic system is shown in Figure 1.

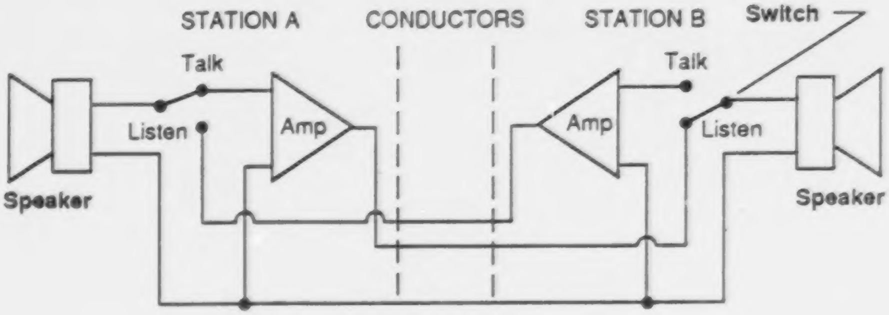

Figure 1 Basic System

In most cases, a speaker in a communications system produces sound for the listener. In an intercom system the speaker serves two functions. It serves as a transmitting device and a receiving device for voice communication. Figure 2 shows station A transmitting voice sound waves and station B receiving the sound. Notice the position of the talk/listen switches at station A and station B.

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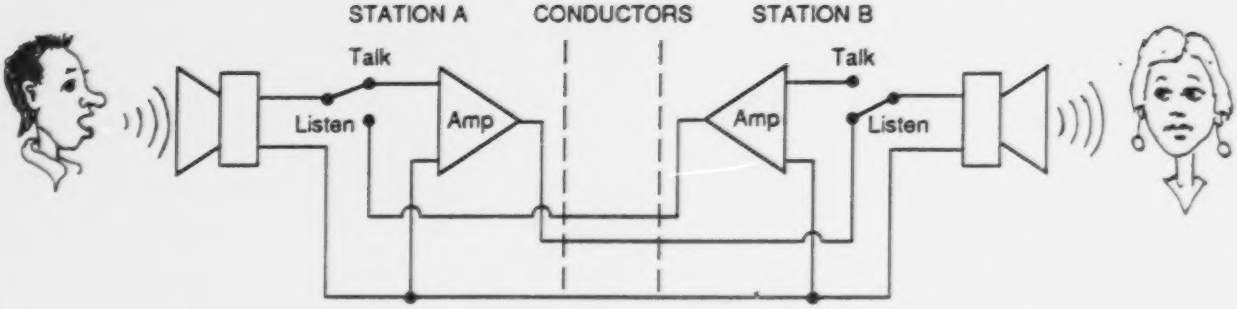
STATION A
CONDUCTORS
STATION B
Talk
Listen
Amp
Amp
Talk
Listen

Figure 2 Station A to B Transmission

c. Figure 3 shows how station B now transmits sound waves to station A. Notice the position of the talk/listen switches.

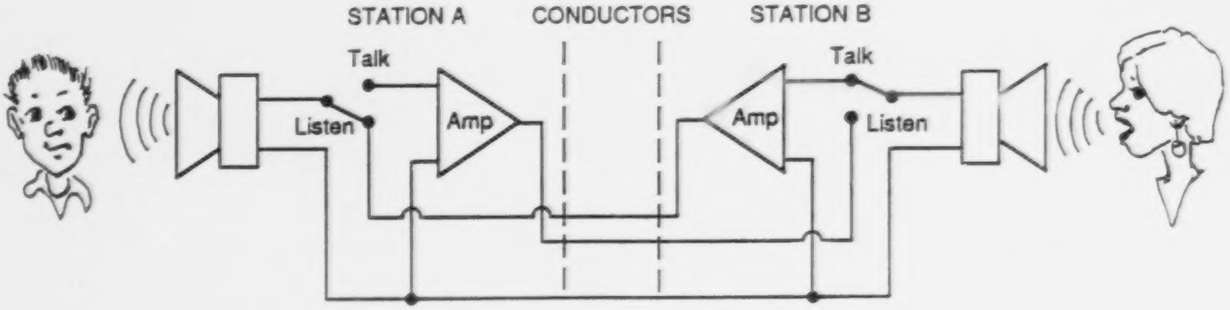
STATION A
CONDUCTORS
STATION B
Talk
Listen
Amp
Amp
Talk
Listen

Figure 3 Station B to A Transmission

d. Dynamic speakers are capable of converting sound waves to electrical current or electrical current back to sound waves.

e. The function of the amplifier is to amplify the speaker's voice for transmission to the listener, as is shown in Figure 4.

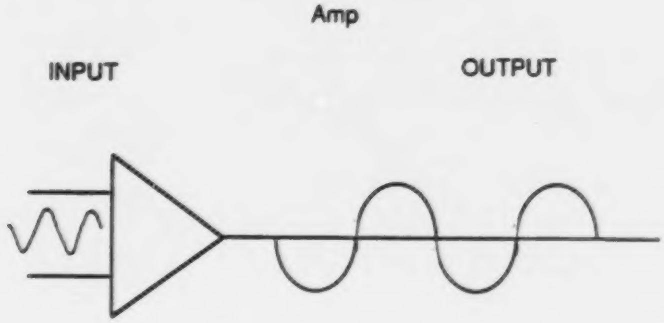

Figure 4 Function of the Amplifier

f. Three wires (hard-wire transmission/reception) are used to transmit and receive the amplified sound waves as is shown in Figure 5.

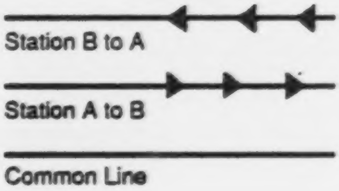

Figure 5 Hard-Wire Transmission and Reception System

Demonstrations

1. Demonstrate operation of a completed two-way intercom system.
2. Show solderless circuit board wiring techniques.
3. Show how to place parts in solderless circuit board.

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Safety

1. Cut wire in a safe manner.
2. Wear safety glasses.
3. Observe polarity (negative and positive leads) of electrolytic capacitors.
4. Observe polarity when making power connections.

Personal Activity

1. Identify electronic components used with TAM.
2. Review parts list.
3. Review circuit schematics.

Needed Materials:

Supplies

(2 of each of the following items are needed for a two-way intercom system)

a. 9 volt battery
b. 9 volt battery terminal
c. LM386 Integrated Circuit (amplifier)
d. SPDT switch
e. 0.005 uF capacitor
f. 0.047 uF capacitor
g. 4.7 uF capacitor, 16 DCWV
h. 10 uF capacitor, 16 DCWV
i. 220 uF capacitor, 16 DCWV
j. 15 ohm resistor, 1/4 watt
k. speaker (at least 4" diameter)
l. wire, 22-24 gauge, solid conductor (1 ft)
m. wire, 22 gauge, stranded or solid conductor (length determined by distance between stations--3 wires will be required.)

Equipment/Machines/Tools

a. wire cutters/stripper
b. solderless circuit board (any size)
c. long nose pliers

Handouts/Instructional Resources

a. Parts/Component identification list
b. Parts placement/schematic
c. Student component of TAM

Activity Sequence

Instructor Start-up & Specific Instructions

a. Handouts
b. Safety briefing
c. Student check to determine if students have all the materials
d. Student check to determine if students have all the tools/equipment
e. Overview of objectives
f. Grading criteria

Pre-Assessment:

1. Determine if students know how to use solderless circuit board.
2. Determine if students know how to use tools.

Plan of Procedure:

1. Operation of basic intercom system.
   This information is contained in "Key information"

2. Recognize the electronic components used in the intercom and associate them with their schematic symbols. (Use the Parts Indentification List on the next page.)
   a. The schematic should be drawn on the chalkboard or placed on a transparency and each student should locate the different components.
   b. Check off each item below when you can locate it on the schematic:

   ( ) Speaker.
   ( ) Talk/listen switch.
   ( ) Conductors.
   ( ) Battery connection.
   ( ) IC.
   ( ) 4.7 uF capacitor.
   ( ) 10 uF capacitor.
   ( ) 220 uF capacitor.
   ( ) Positive and negative leads of electrolytic capacitors.
   ( ) Positive lead of the battery.
   ( ) Negative lead of the battery.
   ( ) Five points that are connected to the negative battery potential.
   ( ) 0.005 uF capacitor.
   ( ) 0.047 uF capacitor.
   ( ) 15 ohm resistor.
   ( ) Three conductors that will be connected to the other intercom station.

3. Construct a basic intercom system from a schematic and pictorial diagram.
   a. Using a solderless breadboard, necessary materials, schematic and pictorial diagrams, and follow the instructions below:

   ( ) Place the LM386 integrated circuit (IC) in the solderless circuit board as shown in the pictorial diagram, at the end of the TAM.
   ( ) Identify pin 1 and pin 8 of the IC.
   ( ) Follow the pictorial and schematic diagram and construct the circuit.
   ( ) When you have constructed the circuit, run three wires (12 ft each) to station B- this will be another student's intercom circuit.
   ( ) Connect one of the wires from the LISTEN position of Station A to the negative lead of the 220 uF capacitor at Station B.
   ( ) Connect one of the wires from the LISTEN position of Station B to the negative lead of the 220 uF capacitor at Station A.
   ( ) Connect one of the wires from pin 4 of the IC at Station A to pin 4 of the IC at Station B. This connects the negative points together.

   b. The intercom system should now be ready for testing.

4. Demonstrate proper techniques for testing an intercom system.

( ) Identify one station to TALK and one station to LISTEN.
( ) Place the switches at the stations into the TALK or LISTEN positions, depending on the station.
( ) At the TALK station, talk into the speaker while holding it close to the mouth. (For the best results the speakers should be at least 4" in diameter). The LISTEN station should hear your voice on the LISTEN speaker.
( ) Using the switches, change the previous TALK station to the LISTEN station and the previous LISTEN station to the TALK station.
( ) Have the TALK station speak into the speaker. If the LISTEN station can hear, the system is completed.

Post-assessment:

1. Grade for circuit neatness ____________________

2. Grade for circuit operation ___________________

3. Grade for circuit explanation __________________

Summary and Wrap-up

a. Circuit operation (For those who want to know more)

This circuit has the advantage of using three wires between stations and is effective at long distances.

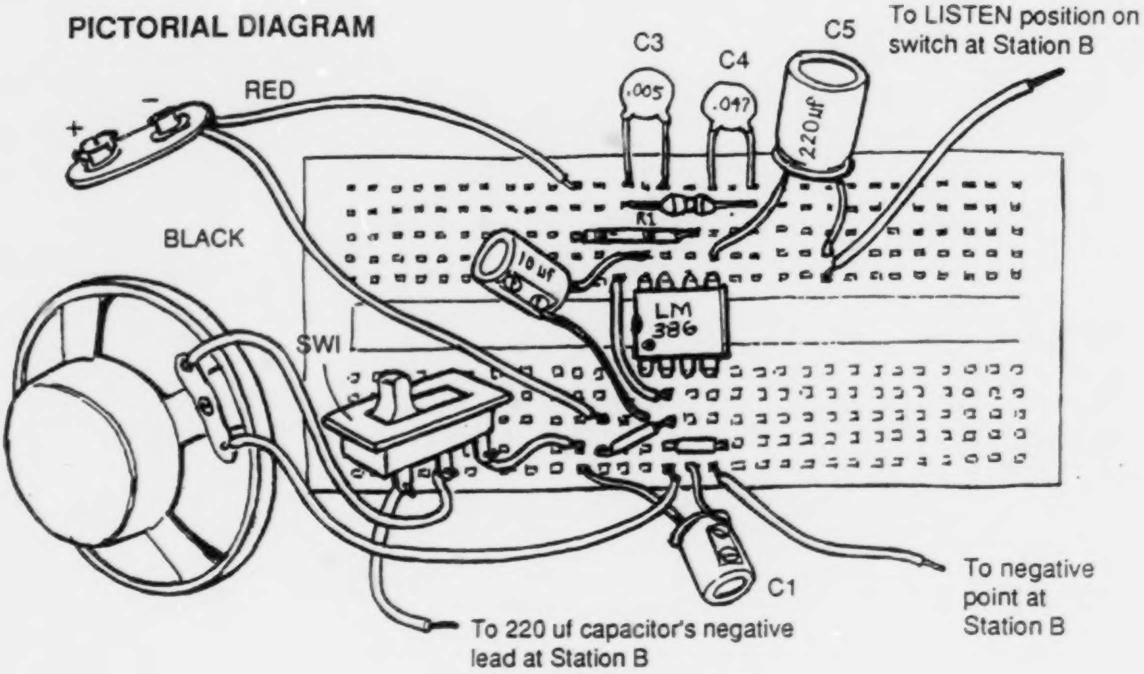
The LM386 IC used in this circuit is a low-voltage amplifier with C2, the amplifier has a gain of 200. omitting C2 reduces the gain to approximately 20. Other gains are possible with the addition of a series R/C combination connected between pin 1 and pin 8. For example, a 1000 ohm resistor and a 10 uF capacitor will produce a gain of approximately 150.

Components R1 and C4 are in the circuit to improve quality. Without those components, the circuit may oscillate.

b. What you will be able to do with other circuits.
1. Identify components.
2. Identify schematic symbols.
3. Construct circuits from schematics on solderless circuit boards.
4. Use this circuit for a useful purpose.

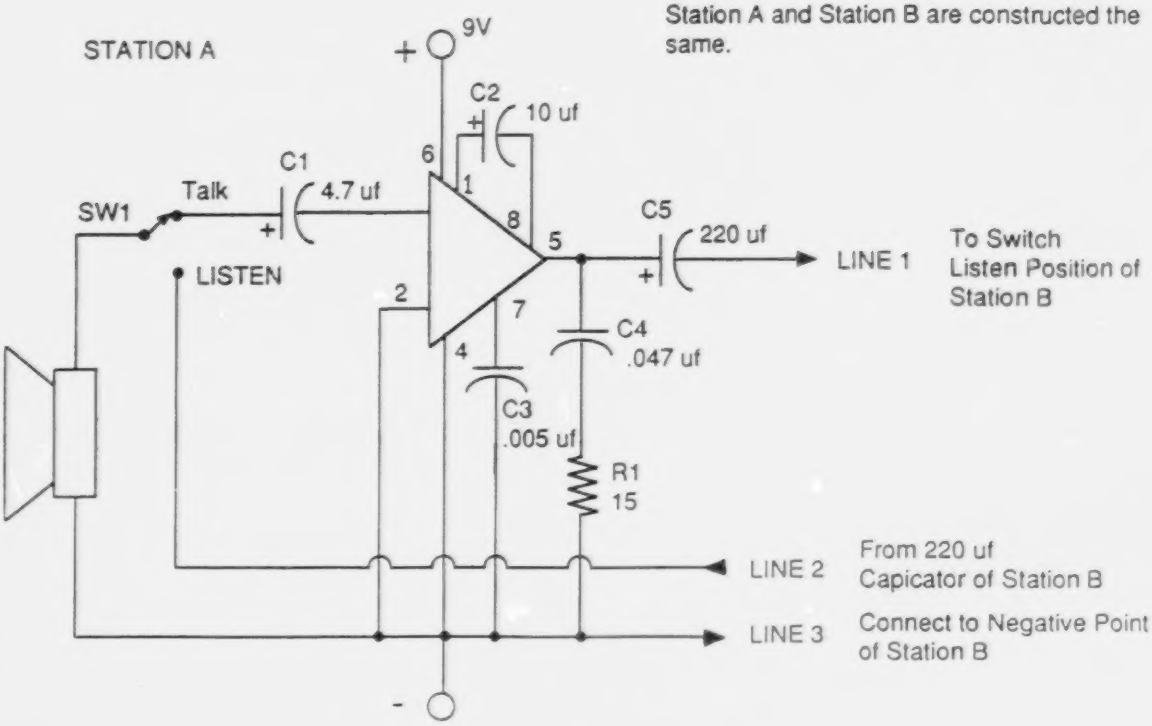
3_0

PICTORIAL DIAGRAM

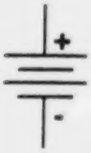
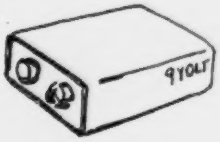
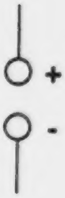
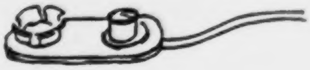
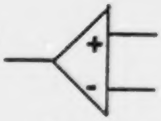
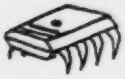
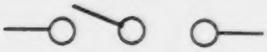
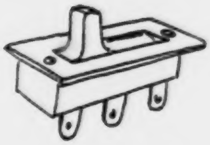
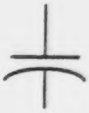
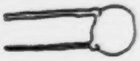
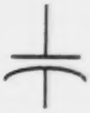
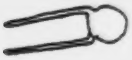
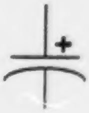
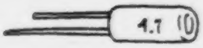
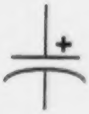
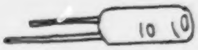
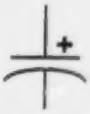
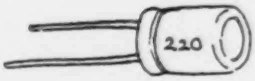
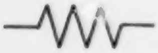
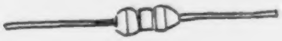
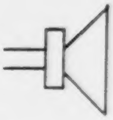
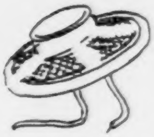
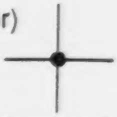
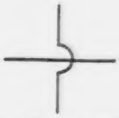
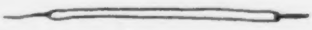

C3
C4
C5
To LISTEN position on switch at Station B
.005
.047
220uf
RED
+
-
BLACK
R1
10 uf
LM 386
SWI
C1
To negative point at Station B
To 220 uf capacitor's negative lead at Station B

SCHEMATIC DIAGRAM

Station A and Station B are constructed the same.


STATION A
+
9V
C2
10 uf
6
1
C1
Talk
4.7 uf
SW1
8
5
C5
220 uf
LINE 1
To Switch Listen Position of Station B
LISTEN
2
7
4
C4
.047 uf
C3
.005 uf
R1
15
LINE 2
From 220 uf Capicator of Station B
LINE 3
Connect to Negative Point of Station B
-

Parts/Component Identification List

PARTS LIST	SCHEMATIC SYMBOL	PICTORIAL
1. 9V Battery		
2. 9V Battery Terminal		
3. LM386 Amplifier IC		
4. SPDT Switch		
5. 0.005 uf Capacitor		
6. 0.047 uf Capicator		
7. 4.7 uf Electrolytic Capacitor		
8. 10 uf Electrolytic Capacitor		
9. 220 uf Electrolytic Capacitor		
10. 10 ohm Resistor		
11. Speaker		
12. Wire (Conductor)	 Connected  Not Connected	

Technology Activity Module 11

HOME SECURITY MONITORING SYSTEMS

by Lynn Ash

Instructor Component

Activity Objectives:

The purpose of this activity is to demonstrate the design and fabrication of a home security monitoring system, given the schematic, components, and fabrication methods.

Target Competencies:

By completing this TAM the student will be able to:

1. Determine the proper safety skills required when constructing the security monitoring system.
2. Know how to safely use a soldering iron.
3. Know how to read a schematic diagram.
4. Determine whether to use a 12 or 5-volt power supply.
5. Determine the best possible sensors to use on the doors or windows that are to be monitored.
6. Know how to properly use an oscilloscope.
7. Know how to properly use a digital volt meter.
8. Determine whether the sensors need to be NO (normally open) or NC (normally closed).
9. Determine when to use a delayed circuit.
10. Determine how to use and interface CMOS (complementary metal oxide semiconductor) integrated chips.
11. Determine how to use diodes in an OR gate and an AND gate configuration.
12. Determine how to use an NAND gate in a Flip-Flop configuration.
13. Determine how and when to use an exit and entrance delay with a single switch.
14. Determine how to calculate the entrance and exit delay.
15. Determine what signal is necessary to saturate the driver transistor to drive a relay.

16. Determine how to connect a standard or solid-state relay to a siren or horn for alarm activation.

TAM Instructions:
Introduction:

This activity is designed to familiarize the student with one of several different methods of designing, component searching, and fabrication of a home security monitoring system. Home security has become a multi-million dollar business. People throughout the country are wanting to protect their personal property against theft and burglary.

Safety Considerations:

The safe handling of electrical wiring, power tools, cutting tools, soldering irons, and electronic power sources should be stressed at all times.

Needed Materials:

Supplies

a. Schematic diagram
b. Proto board or wire wrap board
c. CMOS data book
d. Semiconductor data book for transistors
e. Capacitor code chart
f. Resistor code chart
g. Relay data book
h. Diode data book
i. Siren, buzzer, or sonalert data book
j. NO (normally open) or NC (normally closed) sensor data book
k. Several feet of 22 gauge wire of different colors
l. Rosin-core solder
m. All chips specified in schematic
n. All resistors specified in the schematic
o. All capacitors specified in the schematic
p. All diodes specified in the schematic
q. Siren, buzzer, or sonalert. Whatever is to be used as a warning device.

Equipment/Machines/Tools:

a. Safety glasses
b. Digital voltmeter
c. Oscilloscope
d. Wire cutters
e. Wire strippers
f. Fixed 5 or 12 volt DC power supply
g. 110 volt AC power source
h. Soldering iron

Handouts

a. Component library or data sheets
b. Student component of TAM
c. Resistor and capacitor color code charts
d. Sources and parts availability
e. Wiring techniques

Instructional Resources

a. Film (on home security systems)
    Local sheriff or law enforcement office.

b. Books and Articles
    1. Data books on logic systems:
        Motorola
        National Semiconductor
        Fairchild
        Texas Instruments
    2. Catalogs on vendors and distributors for electronic components:
        Newark Electronics
        St. Louis, MO
        314-298-2505

        Mouser Electronics
        2363 Hwy. 287 North
        P.O. Box 719
        Mansfield, TX
        800-633-2246

        Pioneer Electronics
        2029 Woodland Parkway
        Suite 101
        St. Louis, MO 63146
        800-255-4350
    3. Radio electronics or electronic hobbyist magazine.

c. A guest lecturer:
    Local sheriff or law enforcement officer

Management and Logistics

Evaluation/Grading

a. Safety precautions observed
b. Parts placement
c. Neatness of wiring and soldering
d. Installation procedure
e. Completion of functioning alarm

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Suggested Schedule

a. Varies due to student ability
b. Approximately 6-12 hours

Key Instructional Suggestions:

Safety

a. Proper handling of CMOS integrated circuit
b. Proper handling of soldering iron
c. Proper handling of power tools
d. Proper handling of 110 volt AC and DC power
e. Proper handling of cutting tools

Motivation

a. Use an alarm to demonstrate proper vandalism deterrence.
b. Use an alarm circuit to see who can build the most sophisticated and secure home security system.
c. Use a logic circuit to drive a siren, sonalert, or buzzer.

Prerequisite information

Some knowledge of electronics and electrical wiring, especially DC fundamentals and AC fundamentals is necessary.

Demonstrations

a. Logic signals on a scope
b. Observing time delay on a scope
c. Driving a siren with logic or voltage

Reinforcement

Students are able to use their knowledge of figuring RC time constants in this TAM. They're also able to use the skills they have developed in proto-typing circuits.

Attitudes

a. Home security is a multi-million dollar business per year. Enterprising individuals will be able to serve this market need.
b. Both industry and the private sector is still waiting for the first fool-proof alarm system to be developed.

Remediation/Enrichment

a. Give students hands on fabrication of the circuit.
b. Let slower students read the schematics for more advanced students or vice-versa.
c. Direct advanced students to help slower students especially when assembling the circuit.

Summary and Review

Recap design and fabrication of home security systems.

Review Questions

1. Explain why a home security system is needed.

2. Explain how to properly read a schematic.

3. Explain what is meant by sensors and the meaning of NORMALLY OPEN and NORMALLY CLOSED circuits.

4. Explain the proper way to use an oscilloscope and digital voltmeter for troubleshooting.

5. Explain the difference between CMOS and TTL integrated circuits.

6. Explain the different gates used in the circuit such as AND, NAND, and OR gates.

7. Explain what is meant by entrance and exit delay.

8. Explain why a solid-state relay is used to drive the siren, sonalert, or buzzer.

Glossary

Schematic- Diagram- blueprints of circuits.

Power Supply- power source for alarm.

Sensors- detectors or alarm entry.

Oscilloscope- troubleshooting device

Digital Voltmeter- troubleshooting device.

(NO)- normally open.

(NC)- normally closed.

CMOS- complementary metal oxide semiconductor.

TTL- transistor-transistor logic.

OR, NAND, OR gates & Flip-Flops- logic gates.

Solid-State- electronic device, not mechanical.

Semiconductors- resistors, capacitors, and transistors.

Relay- type of switch.

Fabrication- assembly of alarm circuit.

Design- development of alarm.

Saturated- transistor fully turned on.

RC Time Constant- circuit delay.

Flip-Flop- latching device.

Data Book- diagram and logical function of circuit components.

Pre-Assessment:

Date: ______________ Name: ________________

Class: ______________

PRE-TEST

Instructions: Circle the correct answer.

1. A schematic diagram is:
    A. a blueprint of the circuit
    B. a drawing device

2. Sensors refer to:
    A. electronic diagrams
    B. detectors for alarm entry

3. CMOS means:
    A. complementary momentary off switches
    B. complementary metal oxide semiconductors

4. The abbreviation NO refers to:
    A. normal open switch configuration
    B. no, that is the wrong gate

5. Semiconductor refers to:
    A. resistors, capacitors,and transistors in a circuit
    B. NAND, AND, and OR gates in an electronic circuit

6. TTL means:
    A. today's tiny logic
    B. transistor-transistor logic

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7. NC is the abbreviation for:
    A. Northern California
    B. normally closed switch configuration

8. The term solid-state refers to:
    A. an electronic device, not mechanical
    B. a state on solid financial grounds

9. The term fabrication means:
    A. assembly of circuit components in working configuration
    B. Development of ideas on paper

10. The term design refers to:
    A. development of an electronic circuit
    B. defacing a sign in the hall

Post-Assessment:

Name________________________________

Class Period____________________________

Post Test

Instructions: circle the letter before the correct answer.

1. A power supply is:
    a. a source of power for electronic circuits
    b. a supply house for electronic components

2. An oscilloscope is:
    a. a powerful telescope
    b. a troubleshooting device for electronics

3. What is the proper way to use power tools?
    a. use while standing in a puddle of water
    b. observe all safety requirements on power cord and electrical outlets

4. Most TTL and CMOS circuits require what type of power to operate?
    a. AC power
    b. DC power

5. Why do you need an exit delay on an alarm system?
    a. to leave a building or zone within a certain period of time, without setting off the alarm.
    b. to always have a backup method of leaving a building

6. What is the meaning of the term "saturation of a transistor"?
    - a. completely soak the transistor in ether or a type of fluid
    - b. turning on a transistor until it is on hard, at full + voltage rail or at ground potential

7. In the circuit diagram, how can you change the exit delay?
    - a. change the resistor or capacitor values after the flip-flop configuration in the alarm
    - b. put a switch in place of the gates in the circuit

8. A digital voltmeter is used as:
    - a. a thermometer
    - b. a troubleshooting device to measure voltage, current, or resistance.

9. The siren in the alarm circuit is used as:
    - a. a sounding device to scare thieves and alert people around the area
    - b. a device to run down burglars

10. The proper way to use a soldering iron is:
    - a. pick it up by the tip and use it
    - b. pick it up by the handle and touch the tip of it to the device being connected together

Test Keys

Pre Test

1. A
2. B
3. B
4. A
5. A
6. B
7. B
8. A
9. A
10. A

Post test

1. A
2. B
3. B
4. A
5. A
6. B
7. A
8. B
9. A
10. B

Review Question Answers

Instructor's discretion, which if any of the questions to assign or discuss.

Technology Activity Module 11

HOME SECURITY MONITORING SYSTEMS

by Lynn Ash

Technology Activity Module 11

Student Component

Introduction:

Did you ever wonder if you could build a device that could warn you if someone was trying to break into your house? In this TAM you will become familiar with one method of design and fabrication of a Home Security Monitoring System.

Competencies:

Following the completion of this TAM, you will be able to:

1. Determine the proper safety skills required when constructing the security monitoring system.
2. Know how to safely use a soldering iron.
3. Know how to read a schematic diagram.
4. Determine whether to use a 12 or 5-volt power supply.
5. Determine the best possible sensors to use on the doors or windows that are to be monitored.
6. Know how to properly use an oscilloscope.
7. Know how to properly use a digital volt meter.

8. Determine whether the sensors need to be NO (normally open) or NC (normally closed).
9. Determine when to use a delayed circuit.
10. Determine how to use and interface CMOS (complementary metal oxide semiconductor) integrated chips.
11. Determine how to use diodes in an OR gate and an AND gate configuration.
12. Determine how to use an NAND gate in a Flip-Flop configuration.
13. Determine how and when to use an exit and entrance delay with a single switch.
14. Determine how to calculate the entrance and exit delay.
15. Determine what signal is necessary to saturate the driver transistor to drive a relay.
16. Determine how to connect a standard or solid-state relay to a siren or horn for alarm activation.

Module Overview:

Motivational statement

This module contains activities that show:
1. The design and fabrication of a Home Security Monitoring System.
2. Connection of electrical wiring for a 120 volt siren or horn.
3. Getting hands-on experience in wiring and developing an electronic circuit.
4. Development of a fool proof alarm system that no one can figure out.

Relationship to Context

This TAM links up to the rest of the course in the following ways:
1. Putting a linear device, (transistor and relay) in a circuit completely controlled by digital logic.
2. It lets you see an example of an important technical communication system.

Key Information:

Class Presentations

1. Methods of home security systems design.
2. Methods of home security systems fabrication.

Demonstrations

1. Different methods of designing home security systems.
2. Proper way of reading and interpreting schematic diagrams.

Safety

1. Proper usage of a soldering iron.
2. Proper AC and DC power connection.
3. Always observe wiring code and safety procedures.

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Personal Activity

Before beginning work on these activities it is recommended that you review:

- CMOS digital logic circuits
- Linear or transistor drive circuits
- RC time constants
- Ability to read schematics

Books on the above topics can be obtained from the following:

- Radio Shack
- Heath/Zenith Education Systems
- Goodheart-Wilcox Co.
- Glencore/McGraw-Hill
- EMC Publishers

Videos on the above topics can be obtained from the following:

- Bergwall Video Productions
- Meridian Educational Corporation

Needed Materials:

Supplies

a. Schematic diagram
b. Proto board or wire wrap board
c. CMOS data book
d. Semiconductor data book for transistors
e. Capacitor code chart
f. Resistor code chart
g. Relay data book
h. Diode data book
i. Siren, buzzer, or sonalert data book
j. NO (normally open) or NC (normally closed) sensor data book
k. Several feet of 22 gauge wire of different colors
l. Rosin-core solder
m. All chips specified in schematic
n. All resistors specified in the schematic
o. All capacitors specified in the schematic
p. All diodes specified in the schematic
q. Siren, buzzer, or sonalert. Whatever is to be used as a warning device.

Parts (**Component Library**) are listed as follows:

1	4001 CMOS Quad 2-input NOR gate
1	4011 CMOS Quad 2-input NAND gate
3	Normally open sensors
2	Normally closed sensors
1	Normally closed momentary push-button switch
1	3-24v DC solid state relay
1	12v DC siren, horn, or buzzer
5	1M ohm 1/4 watt resistors
7	100K ohm 1/4 watt resistors
3	3M ohm 1/4 watt resistors

1	10K ohm 1/4 watt resistor
6	1N4148 switching diodes
1	2N2222 or 2N3904 NPN transistor
8	.01 uf 25v ceramic capacitors
2	10 uf 25v electrolytic capacitors
1	47 uf 25v electrolytic capacitor

Equipment/Machines/Tools

a. Safety glasses
b. Digital voltmeter
c. Oscilloscope
d. Wire cutters
e. Wire strippers
f. Fixed 5 or 12 volt DC power supply
g. 110 volt AC power source
h. Soldering iron

Handouts/Instructional Resources

a. Component library of data sheets
b. Student component of TAM
c. Resistor and capacitor color code chart
d. Sources and parts availability
e. Wiring techniques
f. film (on home security systems)
g. Books and articles
    *Data books on logic systems
    * Catalog on vendors and distributors of electronic components
    * Radio Electronic or hobby magazines
h. A guest lecturer

Glossary

Schematic- Diagram- blueprints of circuits.

Power Supply- power source for alarm.

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Oscilloscope- troubleshooting device

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Relay- type of switch.

Fabrication- assembly of alarm circuit.

Design- development of alarm.

Saturated- transistor fully turned on.

RC Time Constant- circuit delay.

Flip-Flop- latching device.

Data Book- diagram and logical function of circuit components.

Activity Sequence:

Instructor start-up & specific instructions

Participate in your instructor's start-up activities and presentation for this TAM. Follow all instructions: read the assigned material and review the steps of the procedure.

Pre-Assessment:

Complete the pretest given by your instructor.

Plan of Procedure

1. Locate schematic diagram (last page of TAM).

2. Locate all the components and parts needed for the fabrication of the circuit.
   Parts (**Component Library**) are listed as follows:
   1 4001 CMOS Quad 2-input NOR gate
   1 4011 CMOS Quad 2-input NAND gate
   3 Normally open sensors
   2 Normally closed sensors
   1 Normally closed momentary push-button switch
   1 3-24v DC solid state relay

1 12v DC siren, horn, or buzzer
5 1M ohm 1/4 watt resistors
7 100K ohm 1/4 watt resistors
3 3M ohm 1/4 watt resistors
1 10K ohm 1/4 watt resistor
6 1N4148 switching diodes
1 2N2222 or 2N3904 NPN transistor
8 .01 uf 25v ceramic capacitors
2 10 uf 25v electrolytic capacitors
1 47 uf 25v electrolytic capacitor

3. Have all data books needed for looking up pin-outs and specifications of the components required for operation.

4. If you are using a proto board for wiring up the circuit, you will have to cut and strip the 22 gauge wire as needed for construction of the circuit.

5. Install the 4001 NOR gate and the 4011 NAND gate on the proto board.

6. Start by connecting 2 of the NO sensors (S1 and S2) to the inputs of the two 4001 NOR gates. And the other NO sensor (S5) to the input of one of the 4011 NAND gate. Follow the schematic diagram for the correct connection (last page of TAM).

7. Next, connect the NC sensors (S3 and S4) to the inputs of the proper NOR and NAND gates. Follow the schematic diagram for the correct connections.

8. Install the 1M ohm resistors and the .01uf capacitors to the inputs of the proper NOR and NAND gates. Follow the schematic diagram for proper connection. These are the pull-up or pull-down resistors needed for proper circuit operation when the sensors are in their normal state, no alarm condition.

9. Next, install the RC (resistor-capacitor) time delay circuit for S1, S2, and S3 sensors. These are the four .01uf capacitors and the four 100k ohm resistors on the outputs of the NOR and NAND gates. Follow the schematic diagram for proper connection. This is where you can vary the amount of entrance delay that your particular situation may require.

10. Install the two diodes (D1 and D2). Follow the schematic diagram for proper connection. These diodes perform the AND gate configuration. This allows us to AND our inputs from three different sensors (S1, S2, and S3) together.

11. Install the two diodes (D3 and D4). Follow the schematic diagram for proper connection. These diodes perform the OR gate configuration. This allows us to OR our inputs from two different sensors (S4 and S5) together.

12. At this point, take your oscilloscope and check to see of you get proper operation from the five sensors that you have installed. From the point after the diodes of each delay and non-delay circuit, you should have a change of logic level when any of the sensors are activated. The three sensors (S1, S2, and S3) will have a delay on them from the RC time constant that we discussed earlier. The two sensors (S4 and S5), will have no delay. The results will be instantaneous.

13. Connect the other half of the 4011 NAND gate in the flip-flop configuration. Also, connect 100k ohm resistor to the input of the flip-flop. Follow the schematic diagram

for proper connection. This is a pull-up resistor, to allow the input of the flip-flop to be at the proper operational state before the activation of the alarm.

14. Install the .01 and 10uf capacitor, and the 3M ohm and 100K ohm resistor on the output of the flip-flop stage of the circuit. Follow the schematic diagram for proper connection. This is to allow the flip-flop circuitry to operate properly.

15. Install diode (D3) and the 100K ohm resistor as shown in the schematic. This is to allow us to connect the two separate alarm circuits together without causing any confusion to either one of the two circuits.

16. Connect the other half of the 4001 NOR gate, the 47uf capacitor, and the 3M ohm resistor into the circuit. Follow the schematic diagram for proper connection. This is the latch or flip-flop that controls the output siren. When this latch is activated, it means that a sensor has activated and an alarm condition exists.

17. Install the 10uf capacitor, the 3M ohm resistor, and the momentary push button switch. Follow the schematic diagram for proper connection. This is the point where you can adjust the amount of exit delay that you desire. This is what resets or cancels the alarm after an alarm condition has been set. By resetting or canceling this point, you have turned the alarm off temporarily for a short period of time. This condition is set by the RC time constant of the 10uf capacitor and the 3M ohm resistor.

18. Install the 10K ohm resistor and the NPN transistor. The transistor can be any general purpose NPN transistor. (2N2222, 2N3904, 2N708, etc.). Follow the schematic diagram for proper connection. The resistor is for coupling purposes and the transistor is the driver stage for the alarm relay. The transistor is functioning as an electronic switch in this arrangement. When the transistor becomes saturated with the signal from the flip-flop stage, it basically has ground potential on the collector, making it a switch.

19. Install the alarm relay and diode (D6). Follow the schematic diagram for proper connection. One side of the coil connects to the + voltage and the other side of the coil connects to the collector side of the transistor. The alarm relay is used to drive the output siren, horn, buzzer, or sonalert. Diode (D6) is used as protection against inductive kick-back through the circuit from the coil of the relay.

20. Next, install the last component of the circuit. Install the siren, horn, buzzer, sonalert, or whatever output device you may want on the output. Connect the relay contacts to the device the proper way. This is the place that you may have to hook the output device up to a 110 volt AC source. This will let you and everyone else around your house, know when an intruder has entered your premises uninvited.

Post-Assessment:

Instructions:

1. Complete the self check (double check wiring configuration) on the fabricated security system.
2. Have the instructor complete the evaluation and discuss discrepancies.
3. Complete the Post-test for TAM #1.

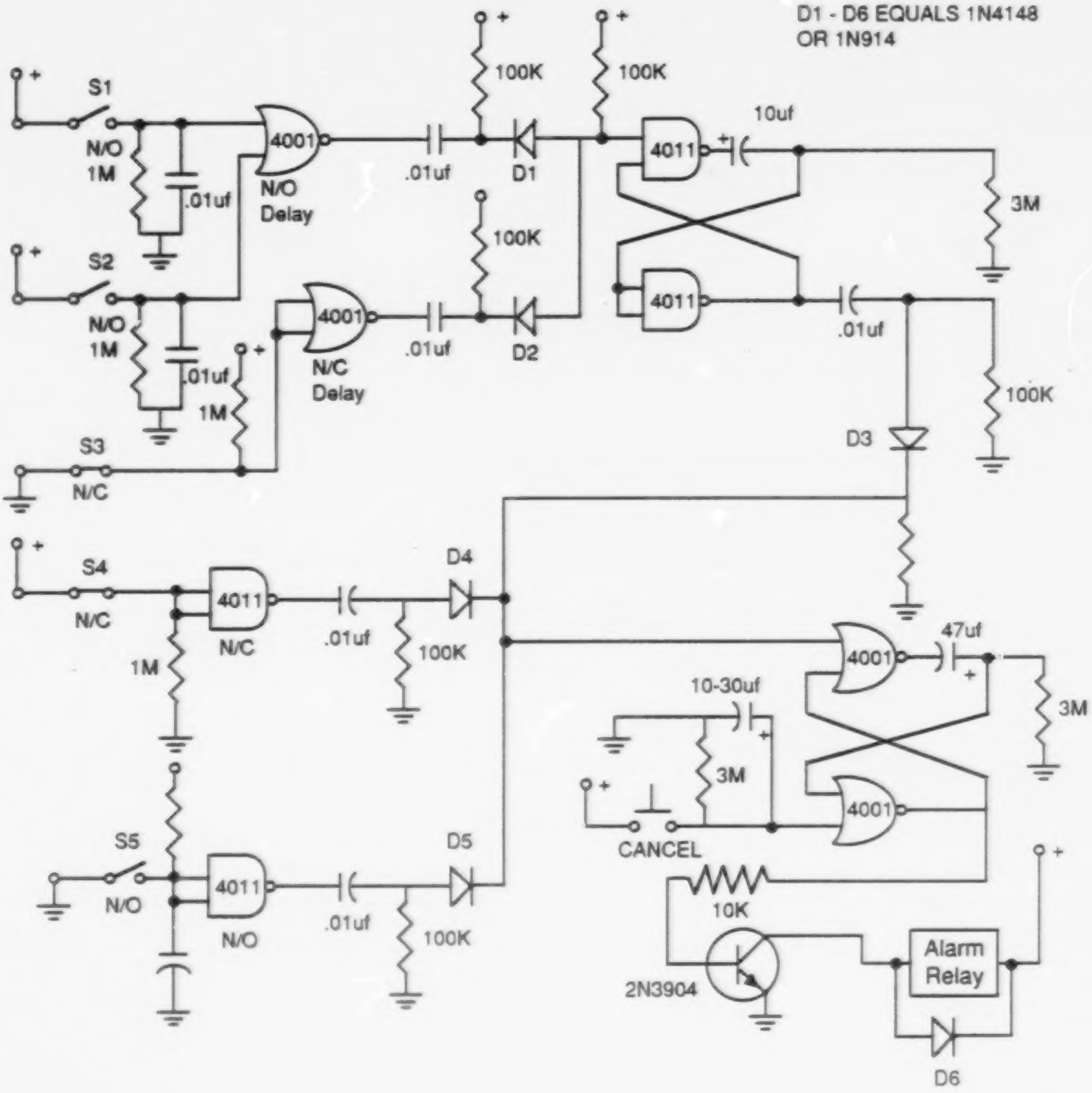
4. If your results demonstrate mastery, go on to the next TAM or activity assigned by your instructor. If less than completely successful, see your instructor and plan what to do to raise your level of mastery.

Summary and Wrap-up

Review Questions:

1. What is a Home Security Monitoring System used for?
2. What DC voltage can you use with CMOS logic, +5 volts or +12 volts and ground?
3. What is the difference between a NO and NC sensor?
4. What is the difference between the logical output of a NOR and a NAND gate?
5. How is an OR gate and an AND gate developed out of diodes?
6. Why is an entrance and exit delay needed in an alarm circuit?
7. What is the purpose of pull-up and pull-down resistors?
8. What is a flip-flop used for?
9. How do you figure out the proper delay time using a RC time constant?
10. What is the purpose of a NPN transistor in this circuit?
11. Why is a diode used across the coil of a relay in logic circuits?
12. On the schematic diagram, what are S1, S2, S3, S4, and S5 used for?
13. What is the RC time constant used for on the cancel switch?
14. What is the purpose of the cancel switch?
15. Why is the alarm relay required?

HOME SECURITY SYSTEM



D1 - D6 EQUALS 1N4148
OR 1N914

S1
N/O
1M
.01uf
4001
N/O
Delay
S2
N/O
1M
.01uf
4001
N/C
Delay
1M
S3
N/C
.01uf
.01uf
100K
100K
D1
D2
100K
4011
4011
10uf
3M
.01uf
100K
D3
S4
N/C
4011
N/C
1M
.01uf
100K
D4
S5
N/O
4011
N/O
.01uf
100K
D5
4001
4001
47uf
3M
10-30uf
3M
CANCEL
10K
2N3904
Alarm
Relay
D6

Technology Activity Module 12

FM
TRANSMITTERS

by Clark Homoly

Technology Activity Module 12

Instructor Component

Activity Objectives:

This TAM will help students understand how an FM radio signal is generated. It does this through activities that demonstrate how to design and construct a printed circuit board. Students will learn how to mount the circuit components and how to test them.

Target Competencies:

1. Students will be able to state how frequency modulation differs form amplitude modulation.
2. Students will be able to draw a block diagram of an FM transmitter and identify the purpose of each block.
3. Students will be able to read a standard schematic of an FM transmitter.
4. Students will be able to construct a simple FM transmitter on a conventional printed circuit board.
5. Students will be able to prove competencies in the above activities by passing a written test and creating an operational transmitter.

TAM Instructions:

Introduction:

It is necessary to begin this unit with an explanation of how FM differs from AM. This is best done through the use of waveform drawings. A block diagram of an FM Transmitter should be contrasted to one from an AM transmitter. Students will then be given a schematic for a two transistor FM Transmitter circuit. When the circuit has been described, students will plan a printed circuit board to interconnect the parts. After the board is etched and drilled, all components will be mounted and the circuit tested.

Safety considerations

1. Safety glasses should be worn when any soldering, drilling, cutting or etching is going on in the lab area.
2. Basic drill press safety instruction is needed if this tool is used.
3. General hand-tool safety instruction may be necessary for some students.

Needed Materials:

Supplies

a. One parts set per student. (See parts list which accompanies schematic.)
b. Six square inches of copper clad circuit board per student.
c. Solder assorted scraps of hook-up wire, 6-32 machine screws 1/2 " long with nuts, carbon paper, steel wool, resist paint, ferric chloride.

Equipment, Machines, Tools

a. Drill press
b. Soldering pencils and holders
c. Hand reaming tool
d. Multimeters
e. FM Radio receiver
f. Assorted small files
g. Several drill bits # 55
h. Assorted drill bit set
i. Assorted screwdrivers
j. Diagonal cutters and long nose pliers
k. Hack saw
l. Glass etching pan

Handouts

a. Schematic and parts list for the FM transmitter

Instructions Resources

Gerrish and Dugger TRANSISTOR ELECTRONICS (Goodheart-Willcox Company, 1981.)

Management and Logistics

Related TAM's

None

Evaluation and Grading

Since a major goal of this TAM is the proper functioning of the transmitter, it is necessary to have each student demonstrate to the instructor the proper operation of the unit on any FM receiver. Tell the students to be sure their battery is fresh before showing the transmitter operation. (**Note**: It is not unusual for a student to accidently leave their project switched on overnight, thus depleting their battery before they set out to prove their project works.)

Have students, one at a time, switch their transmitter on and talk into the microphone. The instructor will tune for their signal on the radio while they modulate the signal. After this proof of performance is accomplished, have the students remove their battery so theirs will not interfere with others being tested.

The instructor may choose to test projects by having students leave them all for the teacher to test at his leisure.

When the projects are tested, it is advisable to write a short message to the student describing any deficiencies or errors in the project. A general grading scheme may be:

A - Project functions and is neatly constructed.
B - Project functions, but there are some minor neatness violations.
C - Does not transmit, but has a neat layout and proper soldering.
D - Poor layout, nonfunctioning.
F - Nonfunctioning, numerous errors in layout and assembly.

The posttest on this TAM should include a variety of multiple choice and schematic drawing questions. This test on FM theory should count approximately half the grade. The project itself should count the other half.

Suggested Schedule

3 hours:	Lecture discussion of the principles of FM transmission.
1 hour:	Introduce the circuit to be constructed in lab.
1/2 hr:	Practice with a classroom example of printed circuit layout.
3 hours:	The layout of the actual circuit, etching the board, drilling the board.
2 hours:	Soldering all parts to the finished board.
1 hours:	Testing and adjusting the finished circuit.

Key Instructional Suggestions:

Safety

a. Locate a book on woodworking which includes drill press safety procedures. Type these procedures and hand them to students during class.

b. Give the class a short demonstration in proper soldering techniques on an old circuit board. You may let them practice on it if desired.

c. Demonstrate etching and the safe use of acids.

Motivation

Before any time is spent on FM theory, have a functioning FM transmitter like the one to be built ready for demonstration. Talk over any FM radio received, showing the sensitivity of the project.

Prerequisite information

Show all common schematic symbols and tell what they mean. Also, discuss units of measurement for resistors and capacitors.

Demonstration

a. Circuit layout on paper.
b. Board preparation and layout.
c. Painting on the resist with nail polish or resist pen; etching the circuit board. Proper cleaning of the resist from the etched board.
d. Proper drilling technique.
e. Proper soldering technique.

Reinforcement

Have the paper layout of the circuit checked by other students and then turned in for evaluation. Return them to students for use with their boards.
Show students a poorly soldered board that also exhibits careless layout. Keep this teaching aid to emphasize what not to do. Let the students compare it to a neat example built by the instructor.

Attitudes

Attempt to engender an attitude supporting the importance of FM transmission in everyday life, and of precision, quality work.

Remediation/Enrichment

a. Advanced students may wish to also build a related circuit which operates in the AM mode on the AM broadcast band. There is a circuit for this shown in the textbook Transistor Electronics.

b. Slower students could be assisted by faster students who finish early. It is important that all students finish at least the FM transmitter.

Summary/Review

A functioning project and at least 75 % on a post - test will indicate success in this TAM

Review Questions

1. Draw a block diagram of an FM transmitter. Label all blocks.
2. Show how an FM signal differs from AM signal.
3. What advantages does FM have over AM?
4. What are the general points to consider when laying out the parts for a printed circuit board?

Glossary

FM- frequency modulation.

AM- amplitude modulation.

Modulation- the process of placing intelligence on the radio signal.

Resist- a material such as fast-dry enamel paint which will prevent the chemical etchant from removing the copper under it.

Etchant- a chemical, usually ferric chloride, which will remove copper from a circuit board.

Oscillator- a circuit which will produce a continuous repetitive waveform.

Multiplier- a circuit which will double or triple the input signal frequency.

Resonance- the natural frequency at which an oscillator will produce a signal.

Tank Circuit- a coil and capacitor placed in parallel.

Pre-Assessment:

Pre-Test/Procedure

1. Draw the schematic symbols for the following electronic parts:
    a. Resistor
    b. Capacitor (fixed)
    c. Capacitor (variable)
    d. Coil
    e. Transistor (NPN)
    f. SPST switch
    g. Battery
    h. Antenna
    i. Inductor
    j. Diode

2. What is the abbreviation for micro farad?
3. What is the abbreviation for pico farad?
4. What is the abbreviation for kilo ohms?

Post-Assessment:

Post-test/Procedure

1. Draw an AM waveform:

2. Draw an FM waveform:

3. Draw a block diagram for a typical commercial FM transmitter. Label all blocks

4. Draw the block diagram for the simple FM transmitter in this TAM.

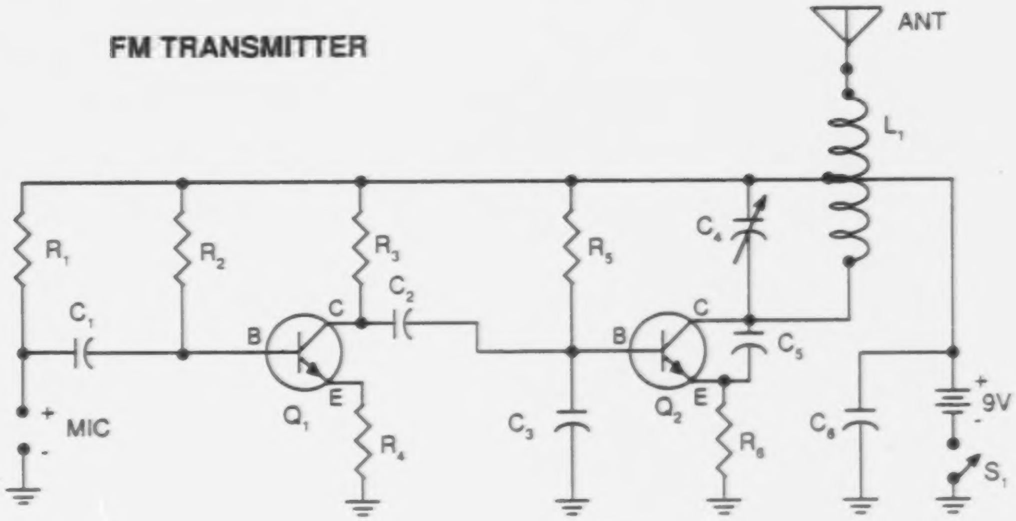
5. What advantage does FM have over AM?

Review Question Answers

(from Student Section)

A. To determine the necessary spacing or dimensions for the copper pands.
B. Q1 amplifies the audio from the microphone. It causes the Q2 section to deviate in frequency.
C. Q2 is an LC oscillator that oscillates on the FM band. It creates a radio frequency signal.
D. The resonant frequency of the oscillator tank circuit is controlled by the size of C4 and L1. C4 is variable.
E. Yes, because the oscillator section will still produce an unmodulated signal.

FM TRANSMITTER


ANT
L1
R1
R2
R3
R5
C4
C1
C2
C
B
E
Q1
C
B
E
Q2
C5
+
9V
-
+
MIC
-
C3
C6
R4
R6
S1

Parts List:

1. Resistors: 1/4 or 1/2 watt

R1 1K
R2 220K
R3 10K
R4 69 ohm
R5 100K
R6 470 ohm
2. Capacitors: at least 16 V rating
C1 .1 uF
C2 4.7 uF
C3 .001 uF
C4 6 - > 50pF
C5 10pF
C6 .1 uF

3. Battery 9V with clip or holder.
4. SPST switch
5. Coil L1: hand wind by winding 6 turns of # 20 wire on 1/4" form. Other wire gauges suitable. Solder a tap in the center.
6. Q1 and Q2 - 2n2222 transistors

7. Telescoping antenna
8. Electric microphone
9. Plastic box approximately 3" X 6"
10. 2"x 3" single side copper clad circuit board material.

Technology Activity Module 12

FM

TRANSMITTERS

by Clark Homoly

Student Component

Introduction:

This project will help you understand the manner in which an FM signal is created. You will learn how to design and etch a printed circuit board and how to properly mount the components for the transmitter.

Competencies:

At the end of this TAM you will be able to :

1. State in writing the difference between AM and FM.
2. Draw a block diagram of an FM transmitter. Label each block.
3. Tell the names of all the components on the schematic of the FM transmitter.
4. Design a printed circuit to interconnect all components of a two transistor FM transmitter.
5. Assemble a working FM transmitter from your set of parts.
6. Score at least 75% on a written test over FM theory.

Module Overview:

Motivation Statement

This compact transmitter will let you project your voice to any FM Stereo up to several hundred feet from the transmitter. Since this project is battery powered, it is possible to hide it and monitor any intruders in a room. Some people like to feed music in the MIC terminals and have their own FM broadcast station where they can be an FM D.J.

Relationship to Context

FM transmitters are just one type of several used to transmit voice, music, or data to distant points by means of a radio signal. When you study transmitters, this is one of the most important types. Most people own an FM receiver, and millions of police, fire, military and business transmitters are FM mode.

Key Information:

Class Presentations

1. How FM signals differ from AM signals.
2. What advantages FM has over AM.
3. Block diagrams of FM transmitters.
4. How the project schematic relates to a block diagram.
5. How to plan and lay out a printed circuit from the schematic.
6. How to apply the resist to the circuit board.
7. How to etch the board in ferric chloride.
8. How to drill the holes properly.
9. How to mount component on circuit board.
10. How to solder the components on the board.

Safety

1. Safety glasses are necessary when soldering and using the drill press.
2. When using the drill press, beware of getting your hair close to the spinning chuck.
3. Do not hold tiny parts in your hand when drilling.
4. Do not try to drill large holes over 1/4" D in thin plastic or sheet metal.
5. When etching the circuit board, safety glasses will protect you from splashing chemicals.

Personal Activity

1. Required reading:
   Transistor Electronics, pp. 279 - 293 (or equivalent from another text).

2. Homework:
   Make a printed circuit layout in pencil on graph paper. Have another student check it be- fore turning it in for the teacher's approval. Try to use a layout different from the one in the textbook.

Needed Materials:

Supplies

See parts list for the project.

The teacher will provide solder, ferric chloride, steel wool, resist paint, small machine screws, carbon paper, and circuit board cut to size.

Equipment, Machines, Tools

1. Drill press
2. Small files
3. Long nose pliers
4. Diagonal cutters
5. Solder pencil and holder
6. Assorted screwdrivers
7. Hand reaming tool for large holes
8. Hack saw
9. Etching pan (plastic or glass)
10. Drill bits--assorted

Handouts/Instructional Resources

FM transmitter schematic and parts list.

Activity Sequence:

Instructor start-up & specific instructions

Take the pre-test to help familiarize you with what each schematic symbol means.

Pre-Assessment:

Observe all instructor demonstrations.

Plan of Procedure

1. Identify and name each part in your parts set and match it to its schematic symbol.
2. Do a practice circuit board layout on graph paper, use pencil so changes can be made. Measure your parts so you know exactly how much space to leave for each one.
3. Have your layout approved before you transfer it to the copper clad board with carbon paper.
4. Paint on the resist. Do not worry about mistakes. When the paint oar resist is dry, a razor blade can be used to scrap away excess coating.
5. Etch the board for at least 45 minutes. It takes this long, or longer, to remove all the unwanted copper. Once you are sure the etching is complete, wash the board in a sink, and scrub the resist with steel wool. Leave the board with clean shiny copper.
6. Drill all holes with a # 55 drill bit where each component lead is supposed to pass through the board.
7. Install components on circuit board.

350

8. Solder on all parts.

9. Test the transmitter by listening on an FM radio. A thumping sound will be heard as you adjust C4. Try to get its frequency near the center of the band. Listen for the strongest signal as you adjust it.

10. If the transmitter fails to oscillate, it is likely the fault of Q2. Try another transistor in its place.

11. While counting into the microphone, try tuning the receiver for best reception.

Post-Assessment:

Take the post - test to show your knowledge of FM transmitters.

Review Questions

A. Why is it necessary to have the actual parts on hand before doing a circuit board layout?

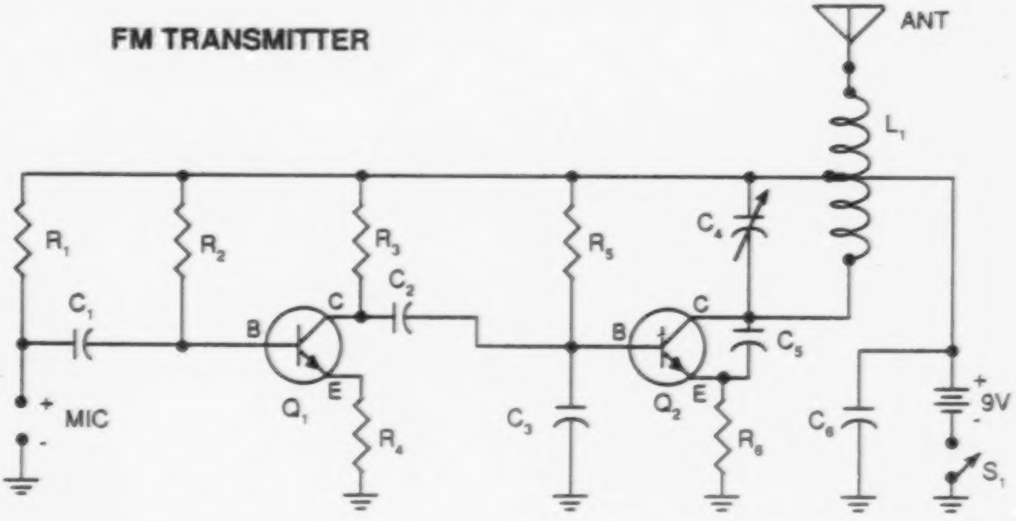
B. What is the purpose of Q1 on the schematic?

C. What is the purpose of Q2 on the schematic?

D. Why does adjusting C4 cause the oscillator to change frequency?

E. If Q1 were removed, would it be possible to hear any signal on the FM radio? Why?

FM TRANSMITTER


ANT
L1
R1
R2
R3
R5
C4
C1
C2
C
B
B
C
C5
+ MIC
-
E
E
Q1
R4
C3
Q2
R6
C6
+
9V
-
S1

352

Parts List

1. Resistors: 1/4 or 1/2 watt

R1 1K
R2 220K
R3 10K
R4 69 ohm
R5 100K
R6 470 ohm
2. Capacitors: at least 16 V rating
C1 .1 uF
C2 4.7 uF
C3 .001 uF
C4 6 - > 50pF
C5 10pF
C6 .1 uF

3. Battery 9V with clop or holder.
4. SPST switch
5. Coil L1: hand wound by winding 6 turns of # 20 wire on 1/4" form. Other wire gauges suitable. Solder a tap in the center.
6. Q1 and Q2 - 2n2222 transistors

7. Telescoping antenna
8. Electric microphone
9. Plastic box approximately 3" x 6".

Technology Activity Module 13

BUILDING AN AM RADIO RECEIVER

by Jerry Richter

Instructor Component

Activity Objectives:

Radios are all around us. Even though they help to keep us safe, make us comfortable, entertain us and keep us informed, we take them for granted. Radios are an important part of our lives, whether we're at work, in our homes, in our cars, planes, trains, ships and trucks. Take a look around you. How many radios do you own? But, how do these amazing devices work? In this activity, students will examine build and test an AM radio receiver.

Target Competencies:

After finishing this TAM students will be able to:

1. Use eleven standard electronic symbols and create a schematic drawing of a radio receiver.
2. Use a schematic drawing as a guide to identify the functions of the following radio parts:
    a. tuning circuit
    b. antenna
    c. inductor
    d. capacitor #1
    e. ground
    f. reproductive circuit
    g. diode
    h. capacitor #2
    i. transistor
    j. resistor #1
    k. battery
    l. resistor #2
    m. crystal earphone
3. Using the component parts provided, together with a pictorial or schematic drawing, assemble a radio receiver and demonstrate its capacity to detect signals from the local radio station.
4. Demonstrate safe working habits with the tools provided.
5. Answer correctly 80% of the test questions at the end of the unit.

TAM Instructions:

Introduction

This activity helps students gain an understanding of how the parts of a simple radio circuit function. It does this by allowing them to sketch the circuit and then assemble the parts into a functioning radio. It is suggested that the TAM be incorporated with a larger unit dealing with the propagation and reception of radio signals, and the many uses of radio in society. The TAM includes: demonstrations, procedures, safety instructions, tests, and the radio assemble activity.

Safety Considerations

While this activity poses no immediate danger to the average person, several safety precautions should be heeded:

1. The safe handling and use of soldering irons should be demonstrated.
2. Careful use of hand tools must be encouraged.

Needed Materials:

Supplies

7 117-45 Fahnestock Clips
1 167-65 Battery Clip
1 159-02 Crystal earphone
1 125-15 9 volt battery
1 mini disc 150 pfd capacitor
1 10,000 ohm 1/2 watt resistor
1 220,000 ohm 1/2 watt resistor
1 mini disc .01 capacitor
1 165-21 alligator clip
7 HDW 128 screws (panhead)
1 187-02 adjustable loopstick
1 112-02 alignment tool
1 123-40 soldering iron
1 131-39 iron holder
1 IN34A diodes
1 121-94 solder
1 1/2" X 4" X 6" plywood

Equipment/Machines/Tools:

a. small soldering iron
b. iron holder
c. screw driver
d. contact cement
e. medium sized screw driver
f. small prick punch

Handouts

Student Component of this TAM; **Appendix**: Reading #1,"Electrical Concepts"; Reading #2, "The Radio Circuit"; and a "Pictorial Drawing of the AM Receiver".

Instructional Resources

Coe, Douglas, Marconi: Pioneer of Radio., (New York, Julian Messner, A Division of Simon and Schuster, Inc. 1967.)

Dunlap, Orrin E. Marconi: The Man and His Wireless.,(New York, MacMillan Company, 1938.)

Henington, W. Donald E. How to Read Schematic Diagrams.(New York, Howard W. Sams and Company, Inc. 1975)

Houglum, Roger J. Electronics: Concepts, Applications, and History.(Boston, Breton Publishers, 1980.)

Marcus, Abraham and Marcus, Williams. Elements of Radio. (Englewood Cliffs, New Jersey, Prentice Hall Inc. 1973.)

Stanely, J.A. Electronics for the Beginner. (New York, The Babbs-Menill Company, Inc. 1963.)

Williams, Gerald E. Electronics for Everybody. (Chicago, Science Research Associates, Inc. 1979.)

Management and Logistics
Related TAMS

The TAM, "FM Radio Transmitter", can be used prior to, or concurrently with this TAM.

Evaluation and Grading

a. Examine each student's radio receiver for neatness and accuracy. With an earphone, listen to determine if it is detecting radio signals, music and talk, from the local radio station.
b. Compare student's pre-test and post-test scores.

Suggested Schedule

Assembly and testing of the radio receiver can be completed in two or four class periods. Students who complete the project ahead of others should be asked to sketch and label a schematic diagram of the receiver discussed in the student component of this TAM.

Key Instructional Suggestions:

Safety

a. Never assume the soldering iron is cold.
b. Wear safety glasses.
c. Do not "flip" the soldering iron at anyone; melted solder can fly off the tip.
d. Use rosin core solder (not acid core).
e. Provide for proper ventilation.
f. Unplug the soldering iron immediately after use to prevent tip oxidation.

Motivation

The low cost of the component parts allows for this to be a take home project, an incentive for students. Inform students ahead of time that the sound output in the earpiece is low, but adequate in a quiet room.

Prerequisite information

The instructor should emphasize the safe use of hand tools and the protection advantage of safety glasses.

Demonstration

Important demonstrations include:
a. a discussion of each radio component part and its purpose.
b. circuit assembly.
c. soldering techniques and why parts are assembled in the suggested manner.
d. clean up and storage procedures.

Reinforcement

This TAM should be used to reinforce the concepts of radio transmission, and radio waves learned in the TAM: "FM Transmitters". It also reinforces concepts that may have been learned in mathematics and chemistry.

Attitudes

The key attitudes that are important in this TAM are:
a. safety
b. the advantages of radio communication as compared to hardwired systems,
c. the small amount of energy required by radio to "transport" messages compared to that required to transport mass, such as people and materials.

Remediation/Enrichment

a. Students who find this activity difficult should be paired with other more proficient students.

b. More advanced students might be asked to research ways to incorporate additional circuit components to improve its volume and reception.

Summary and Review

After completing this unit, the students will have learned these major concepts:

- Nature of Electricity
- Conductors
- Resistors
- Circuits
- Tuning Circuit
- Antenna
- Inductor
- Frequency
- Capacitor
- Ground
- Reproductive Circuit
- Diode
- Transistor
- Battery
- Crystal Earphone
- Impacts of radio on lifestyles

Review Questions

a. The Tuning Circuit
    1. Why does the radio receiver need an antenna?
    2. Why does current flow first in one direction, then the opposite direction, in a radio antenna?
    3. What is the job of the tuning circuit?
    4. Describe the physical appearance of an inductor.
    5. Explain how an inductor works.
    6. Describe the physical appearance of a capacitor.
    7. Explain how a capacitor works.
    8. What is the function of ground in the tuning circuit?

b. The Reproductive Circuit
    1. What is pulsed direct current?
    2. Describe the job of the reproductive circuit.
    3. Explain what a transistor does.
    4. What is the most important part of the earphone?
    5. How do quartz crystals create sound?
    6. What is the piezoelectric effect?
    7. Give an example of two good and two poor conductors.

Glossary

Radio - a system of transmission and reception of information by the propagation of electromagnetic radiation as radio waves through space.

Radio Receiver - a device that selects a program from the broadcasting spectrum by selecting a particular carrier frequency but excluding all others.

Electricity - a fundamental force in nature consisting of electron movement.

Circuit - An assembly of conductors and resistors designed to control the flow of electricity for a particular purpose.

Conductor - Material that allows electron flow through it in a relatively easy fashion.

Current - The quantity of electrons flowing through a conductor, measured in amperage.

Volts - Measure of the electrical pressure being exerted by electron flow through a circuit.

Resistor - A material that slows or resists the flow of electrons.

Antenna - A conductive material that transmits electricity when struck by electromagnetic radiation-radio waves.

Inductor - An electronic component designed to select one radio frequency out of many others.

Capacitor - An electronic component that temporarily stores electrical energy.

Ground - A path of least resistance through which all frequencies not selected by the radio tuner flow.

Diode - An electronic component that changes alternating current to direct current.

Battery - A source of stored electrical power.

Transistor - An electrical amplifier.

Quartz Crystal - A material that vibrates when electricity is placed on it.

Pre-Assessment:

Date: ______________ Name: ________________

Class: ______________

TAM: AM Radio Receiver
Pre-test

1. List five common places that radios are used in your town.

2. Draw the electronic symbol for any two of the following: Capacitor, diode, transistor, battery, antenna.

3. Why does a radio need an antenna?

4. What is the function of a transistor?

5. Describe how a crystal earphone changes electricity to sound.

Post-Assessment:

Name__________________________________

Class Period______________________________

Post Test
Building an AM Radio Receiver

1. A radio receiver needs an antenna because it
   - a. generates electricity.
   - b. detects radiation.
   - c. has radio frequencies in it.
   - d. detects direct current.

2. Which of the following is not characteristic of electrons?
   - a. Electrons are found in all elements.
   - b. Electrons are very mobile.
   - c. Electrons cannot be controlled.
   - d. Electrons are at the root of all electrical behavior.

3. A circuit can be viewed as
   - a. a circle of wire.
   - b. a resistor.
   - c. an electrical component.
   - d. a perfect conductor.

4. Current flows alternately in one direction then in the opposite direction in a radio antenna because
   - a. of the effect of the capacitor and inductor.
   - b. the radio's batteries push and pull electricity.
   - c. the antenna is built with switching gates.
   - d. radiation is like a magnetic push and pull.

5. Which of the following is the best electrical conductor?
   - a. Lead
   - b. Tin
   - c. Copper
   - d. Iron

6. The job of the tuning circuit is to
   - a. adjust the volume level of the radio's speaker.
   - b. modify the amount of current flowing into the inductor.
   - c. select one frequency from many that hit the antenna.
   - d. change alternating current to direct current.

7. Which of the following terms best describes the flow of electrons?
   a. Voltage
   b. Current
   c. Ohms
   d. Conductor

8. An inductor works by
   a. amplifying electricity and sending it to the capacitor.
   b. resisting electricity and preventing its flow.
   c. acting like a coil spring and stretching.
   d. storing magnetism briefly and releasing it as current flow.

9. The phrase "a difference in potential" best describes why
   a. one radio station sounds louder then another.
   b. conductors are different than resistors.
   c. electricity flows from one point to another point.
   d. Amps and Volts are identical.

10. A capacitor works by
    a. storing electricity.
    b. amplifying electricity.
    c. grounding electricity.
    d. detecting electricity.

11. The term Volt is a measure of
    a. electrical "push".
    b. electrical resistance.
    c. electrical flow.
    d. electrical temperature.

12. The term Amp is a measure of
    a. electrical "push".
    b. electrical resistance.
    c. electrical flow.
    d. electrical temperature.

13. Select the best definition of electricity:
    a. a flow of heat from a hot place to a cold place.
    b. a form of power flow through a wire.
    c. a type of electrical high voltage.
    d. the flow of electrons through a conducting circuit.

14. Your hair dryer operates with 120V, and 10 Ohms. What is its Amperage rating?
    a. 12
    b. 22
    c. 32
    d. 42

15. Select the best conductor from the following list.
    a. Wood
    b. Iron
    c. Copper
    d. Aluminum

16. How many more times better is iron as a resistor than aluminum?
    a. 3
    b. 4
    c. 5
    d. 6

Test Keys
Building an AM Radio Receiver

Pre Test

1. Radio stations, police departments, airports, fastfood stores, garage door opener

2. See diagrams in the student part of the TAM

3. The antenna detects radio signals (radiation) in the air, converts them into a current flow down the antenna, into the radio set for amplification.

4. The transistor is an electrical amplifier.

5. The earphone contains a quartz crystal that vibrates when electricity is place on it; the vibration is converted to sound the listener can hear.

Post test

1. b.
2. c.
3. a.
4. d.
5. c.
6. c.
7. b.
8. a.
9. c.
10. a.
11. a.
12. c.
13. d.
14. a.
15. c.
16. b.

Technology Activity Module 13

BUILDING AN
AM
RADIO RECEIVER

by Jerry Richter

Technology Activity Module 13

Student Component

Introduction:

Radio is a presence in our lives that we often take for granted. We all grew up with radio; it has always been around us. We frequently purchase or get a radio set but we seldom think about what a radio is. We "turn on" the radio, or listen to the radio or even discuss what is "on" the radio. When it malfunctions we may claim that it is a "cheap" radio, or say that it is getting old. And, yet, have you heard anyone ask recently, "what is a radio?"

Given the wide impact it has on all of our lives, it is strange that few can explain how it works. Yet most households own over five radio sets. Count the number around you; don't forget the clock radio, the radio in your stereo, your transistor radio, and the one in the car. The audio transmission from your television is also a radio. Recently CB (citizens band) radios have become very popular and helpful. With these sets you can send as well as receive radio signals which is great for emergencies and nonsense chit-chat.

Radios are used for intra-agency communication by police, fire departments, ambulance services and taxis. Private businesses consider radio contact between their vehicles essential. Even cement trucks have them! Many people use radio communication to control their home security systems, open their garage doors and to control model air planes and other toys. Position yourself almost anywhere on earth and you can assume that numerous radio signals are silently passing through or around your location!

On a broader scale, radio is a form of communication technology that is indispensable to the very survival of many people. In the form of radar, it is used to control the air space between cities as well as the safe passage and descent of aircraft at all commercial airports. Shipping, a primary means of transporting food stuffs and manufactured products, depends on radio for navigational guidance, and as a means for getting help during times of distress. All modern military organizations direct their activities by using radio. It is scary to think that if the thousands of nuclear missals positioned in both the United States and Soviet Union are ever launched, it will be through the medium of radio that the directives, signals and guidance will be provided. Just think, what if someone makes a mistake!?

Competencies:

Upon completing this TAM you should be able to:

1. Use eleven standard electronic symbols and create a schematic drawing of an AM radio receiver.
2. Use the schematic drawing as a guide to explain how the following radio parts work:
    a. Tuning circuit
    b. Antenna
    c. Inductor
    d. Capacitor #1
    e. Ground
    f. Reproductive circuit
    g. Diode
    h. Capacitor #2
    i. Transistor
    j. Resistor #1
    k. Battery
    l. Resistor #2
    m. Crystal earphone
3. Use the component parts provided by your instructor, along with a pictorial drawing to assemble and test a radio receiver and show your teacher that it works.
4. Use safe working habits with all the tools provided; wear safety glasses.
5. Answer correctly 80% of the questions on a test after completing this unit.

Module Overview:

Motivational statement

Would you want to live without a radio? Did you ever wonder why radios cost so much? Have you ever been curious as to how they work? This TAM will explain how radios work, and show you how to build one! Can you get yours to work?

Relationship to Context

This TAM is related to another one called FM Transmitters. If you are interested, you can learn how to build a device that will let you send your voice over your friend's FM radio!

Key Instructional Suggestions:

Class Presentations

Your instructor will show you what each component part of the radio looks like and explain how each part works.

Demonstrations

Your instructor will demonstrate how to build and test an AM radio receiver.

Safety

Play it safe! Follow all safety instructions, especially regarding safety glasses and soldering. Ouch! You can get hurt.

Personal Activity

This TAM contains two readings that will help you to understand how radios work. Even though they may be challenging, read them, they will help you. Start with Reading #1, "Electrical Concepts", then try Reading #2, "The Radio Circuit". Write answers to the study guide questions at the end of each reading.

Needed Materials:

Tools and Supplies

Check to make sure that you have the following components before you begin building the radio:

7	117-45 Fahnestock clips
1	167-65 Battery clip
1	159-02 Crystal earphone
1	125-15 9v battery
1	Mini Disc 150 pfd capacitor
1	10,000 ohm 1/2 watt resistor
1	220,000 ohm 1/2 watt resistor
1	Mini Disc .01 capacitor
1	165-21 Alligator clip
7	HDW 128 screws (panhead)
1	187-02 Adjustable loopstick
1	112-02 Alignment tool
1	123-4c Soldering Iron
1	131-39 Iron holder
1	IN34A Diode
1	121-94 Solder (rosin)
1	1/2" X 4" X 6" plywood base.

Handouts/Instructional Resources

a. Reading #1- "Electrical Concepts", student component of TAM
b. Reading #2- "The Radio Circuit", student component of TAM
c. Pictorial drawing of the AM Receiver

Activity Sequence:

Pre-Assessment:

Complete the short pretest, ask your teacher to grade it.

Plan of Procedure:

Activity #1:
You should either draw or ask the instructor for a schematic diagram of the AM receiver. The instructor may want to explain this drawing to you before you start building the radio. Get the component parts of the receiver from the teacher. Place the parts on or near their electrical symbols on the drawing. The teacher will discuss each part and describe how it works (see Reading #2, "The Radio Circuit").

Activity #2:
Watch the teacher demonstrate how to assemble the radio receiver; consider doing this in the same sequence as discussed in Reading #2. Work safely, especially when soldering. The receivers can be constructed individually or by pairs of students. Larger groups are not recommended. Get the pictorial drawing handouts of the AM radio receiver if necessary (see handout: Pictorial Drawing, Am Receiver in this TAM).

Activity #3:
Test the AM receiver when you have completed building it. Extend a length of 6 to 8 feet of heavy gauge copper wire out a window. If possible, this antenna should face the direction of the local radio station's transmitter. Mount the other end of this wire at a convenient location in your shop or classroom. Connect your areal wire to it. Tune the receiver to the local station signal. Also, try tuning for the station without being connected to the areal. Compare the difference in volume. Be sure to test your radio in a quiet area; this will improve the quality of the sound in the quartz crystal earphone.

Post-Assessment:

Complete the unit test supplied by the teacher. Try for a grade of 80% or better. Good luck!

Summary & Wrap up

The radio like many other technological marvels, plays a major role in our lives. It entertains us, keeps us informed, and sometimes helps us avoid life threatening occurrences. Just about everyone owns one radio, and frequently people own three or four or even more. But most people give no thought to how radio works. The purpose of this TAM was to analyze the parts, assemble and test an AM radio receiver.

Appendix

READING #1

Electrical Concepts

Electricity! What is it? How does it work for us? How is it measured? Is it dangerous? These are some of the first questions people ask when working with things electrical. And for good reason. Electricity is basic to the operation of modern technological society. Stop the flow of electricity...? Just imagine what would happen! However, this is not a unit on electricity but on how it affects our radio communication system. In short, without electricity, radio would cease to exist.

In order for you to understand how a radio works, you must first know the difference between "direct" and "alternating" current. In this reading, Part 1 will discuss these concepts in a simple fashion. You will become familiar with the concepts of "frequency", "circuit", "parallel circuit", "electromagnetism" and "radio spectrum". Spend some time and read the following section; you will encounter these concepts again during the course of your life.

What is Electricity? The term "electricity" is strongly related to the properties and behavior of the "electron".* From the point of view of electricity, the electron has three important characteristics: the electron has a charge, it has relatively high mobility, and it can be made to move with relative ease. It is this motion of electrons that is at the root of all electrical phenomena. The control of electron movement has produced many benefits for people. For example, electrons moving through a circle of wire, called a "circuit", can be made to operate useful appliances, illuminate our surroundings, run computers and make a radio "play".

Electrons are found in all of the 92 separate elements that make up all forms of matter. Theoretically, at least, electrons revolve around the compact core (protons and neutrons) of atoms in orbital layers or "shells". The electrostatic or magnetic-like attraction between the core and electrons holds the atom together. The electrons in the outermost shell, which are sometimes called valency electrons (and take part in bonding atoms to make solids, liquids, and gases) are only weakly bound to the core in many atoms. The valency electrons of the atoms of common metallic elements are often used to conduct electricity; copper, silver, and aluminum, are examples with valency electrons only weakly bound to their cores. The weakness of this attraction results in the relatively easy movement of the valency electrons from one atom to another. Because electrons are present in all atoms, electricity can be found in many forms in nature: lightening, photo-electricity, and static electricity are examples. All involve the movement of electrons.

This flow is called current. In fact, individual electrons can be made to move along within solid conductors in a "shunting" manner. When this flow is measured, the unit used to express the quantity of electrons is called the ampere or amp. It is named after the French physicist A.M. Ampere. While the effect of current flow entering one end of a circuit is immediate at the other end, each electron is only moving in the directional flow of the current at the rate of approximately 2.54 cm per second (one inch per second). Even so, the effect of electric current passing through thousands of miles of wire is instantaneous.

(Electrons are constituent parts of an atom.) A very light particle is associated with the elementary charge of negative electricity. Each electron has a charge of 4.80×10^{-10} C.G.S. electrostatic units. Its mass is approximately 1/1845 that of a proton.

Although the electrostatic attraction between the core of an atom and its electrons is one of the fundamental forces in the universe, this attraction is not what causes the movement of electrons through a conductor. Instead, current flows between points of "potential difference", one point containing an excess of electrons or a very negative charge, the other point having a deficiency of electrons or a very positive charge. Like other similar phenomena in nature, differences tend to balance each other. For example, hot water when added to cold, tends to transfer its heat to the cold, balancing at warm.

Electrically, a battery (or a house-hold outlet) contains an excess of electrons at its negative end. At the same time, its positive end has only a few electrons. When connected with a conducting wire, electrons immediately flow from negative to positive. When each end has about the same number of electrons the battery is "dead". The pressure caused by the rush of electrons is measured in a unit called volts. (An electrical force, when steadily applied to a conductor whose resistance is one ohm, will produce a current of one ampere.)
If current is thought of as the quantity of electrons flowing past a given point, voltage can be thought of as the pressure behind these electrons. The better the conducting material used the stronger is the push of electrons. Electricity then, is a flow of electrons through a conducting circuit. The quantity and the pressure pushing this flow can be controlled.

Conductors All material can be classified as conductors, nonconductors or some place between these two states. A "good" conductor is one that allows electrons to flow through it in a relatively easy fashion. This electron flow is represented in the figure below.

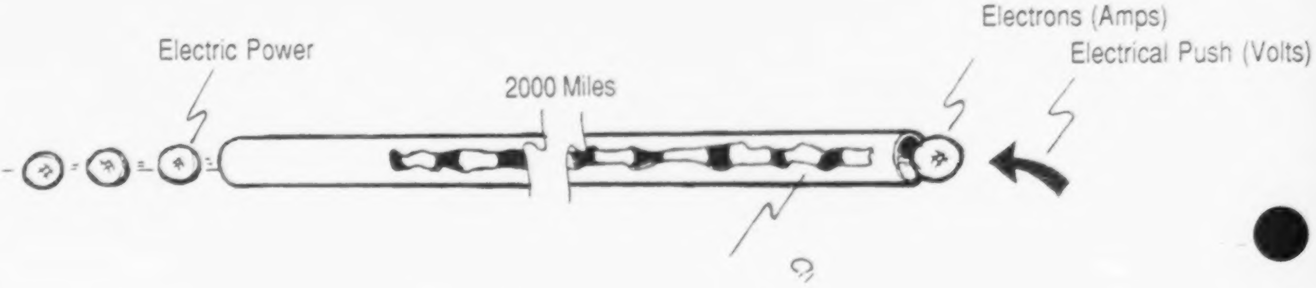


Fig. 1 Visualizing the Flow of Electrons

Although oversimplified, Figure 1 does show the relationship of amps, volts, and ohms to the resistance that the conductor offers to electron flow. Remember that amperage is the unit used to measure the quantity of electrons flowing and voltage the unit used to measure the pressure being exerted by the electrons. The measure of resistance being offered by the conductor, called ohms, is related to the first two measures as follows:

$$\text{amperage (current flow)} = \frac{\text{Electrical Push (volts)}}{\text{Resistance to Electron Flow (ohms)}}$$

Copper is usually considered to be the best conductor. In table 1, copper is considered least resistant and is assigned the value of 1.00. Note that lead is over 12 times less effective than copper as a conductor. It is almost 7 times more difficult to get electrons to flow through steel.

Conductor	Resistance
Copper	1.00
Aluminum	1.59
Brass	4.40
Gold	1.38
Iron	6.67
Lead	12.76
Steel	8.62
Zinc	3.62

Table 1 Effectiveness of Copper Compared to other Conductors

Resistors Even though copper is a very effective conductor, it does offer some resistance to electron flow. Wood, ceramic, plastic and carbon compounds offer such great resistance that practically no current flows through them. Often electrical components are constructed specifically to act as resistors. Like shut off valves in a waterline, these are designed to slow down the flow of current. By slowing down the flow of electrons resistors convert current into heat energy. The heat dissipates into the surrounding air.

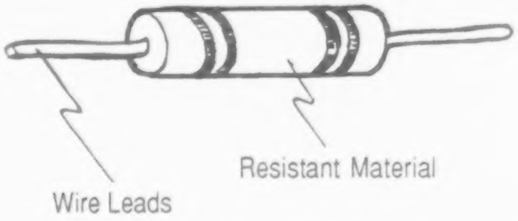


Fig. 2 Typical Resistor Shape

Many resistors are constructed of carbon powder, clay and a binder to hold them together. As shown in Fig. 2, this material is formed into a coated rod, and a wire is then attached to each end. The resistance value, expressed in ohms, is determined by the proportions of carbon, clay and the mass of the resistor.

Name ____________________

Review Questions
Reading #1

On a separate piece of paper write the answers to the following review questions. Review Reading #1 for help.

1. Name three characteristics of electrons.

2. What is a "circuit"?

3. Name three metals that allow easy electron flow.

4. What term is used to describe the flow of electrons?

5. Why do electrons flow from a household wall outlet into an appliance like a hair dryer, toaster, or refrigerator?

6. What is the difference between an Ampere and a Volt?

7. Define "electricity".

8. List three good conductors and three poor conductors.

9. Define the term ohm.

10. Upon examining an appliance at home, you notice that it carries 120 volts with a rating of 12 Ohms. How much current is flowing through the circuit?

11. How many more times difficult is it to get electrons to flow through lead than copper?

12. Is iron a better resistor than aluminum?

13. Define the term "resistor".

14. Name four materials that are good resistors.

READING #2

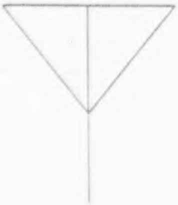
The Radio Circuit

A radio receiver is a set of electronic components designed to detect electromagnetic signals that are created and sent out from a radio transmitter through the atmosphere or through space. After detection by the tuning circuit, the radio's reproduction circuit converts the signals into audio sounds which can be heard by the human ear.

In the simple transistor radio receiver circuit discussed in this reading, eleven component parts are necessary for good reception. The components are wired in two groupings, the tuning circuit and reproduction circuit. Together they compose the radio circuit. Understanding these will allow you to explain and, later, construct a radio receiver. Each part is explained below. The schematic symbol for each component is presented after its name.

The Tuning Circuit:

Antenna



Through the use of transmitters, all radio stations create or propagate electromagnetic radiation at frequencies assigned by the Federal Communications Commission. Each station is assigned a different frequency. These invisible magnetic signals travel through the atmosphere and space at the speed of light. Although the energy of a signal weakens with increasing distance from the transmitting tower, only a very small amount is needed to strike the receiving radio's antenna. This electromagnetic radiation causes or induces a very weak electric current to flow in the antenna which is made of an effective electrical conductor. The current flow in the antenna is proportional to the signal's strength and will continue as long as the electromagnetism acts upon it.

Because the electromagnetic signal is in the form of alternating current, the electricity induced in the metal of the antenna is also alternating current. In a sense, the current can be thought of as flowing back and forth or up and down the antenna (see Fig. 1).The antenna is about 25 meters (75 feet) long. It could be made of single strand insulated or uninsulated 14 gauge copper wire.

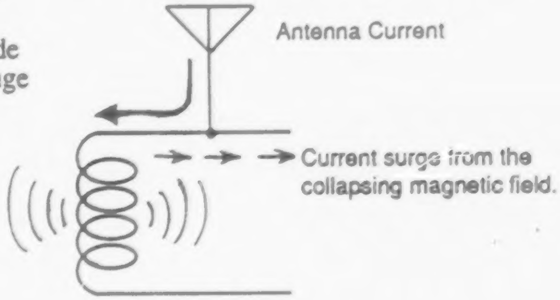


Fig.1 Current flow in the antenna

Inductor

The inductor is a major part of the radio's tuner circuit. The tuner is important because it allows the radio to selectively receive only the desired radio signal. In any given area many stations may be transmitting simultaneously, all at different frequencies measured in kilohertz. The job of the tuner is to select only one signal from a vast number hitting the radio's antenna, thereby allowing only that station to be understandable to the listener.

The inductor is a coil of wire. An inductor can be made by wrapping a cardboard tube with 28 gauge copper wire. The turns of wire must lie next to one another forming a single layer. When current is allowed to flow through the coil of wire, a magnetic field begins to build around the coil. When the magnetic field builds up to its maximum, the coil begins to act like an electrical resister preventing further current flow through its wire.

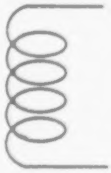


Fig.2 An inductor

A physical analogy to an electronic inductor is a coil spring. Imagine pushing down on the coil spring with your hand. At first its resistance is very small. But, as the spring becomes more and more compressed, resistance to further compression increases quickly. When the spring is fully compressed or "charged" it can be thought of as having the maximum amount of energy stored within it. If you now remove your hand, a counter force ensues; the spring immediately resumes its shape.

The example of a coil spring is helpful because in an inductor, the coil also becomes fully charged. Unlike the spring, however, the inductor temporarily stores magnetic energy. As more and more current flows into the inductor, the larger the magnetic field around the inductor becomes. As the magnetic field becomes larger and larger, it causes the inductor to become more resistant to further incoming current.

Depending on the size and the construction of the inductor, when its magnetic field reaches its maximum, the inductor is fully charged. Like the coil spring, it then reacts by discharging. Said another way, the magnetic field collapses and pushes current of the selected frequency in the opposite direction.

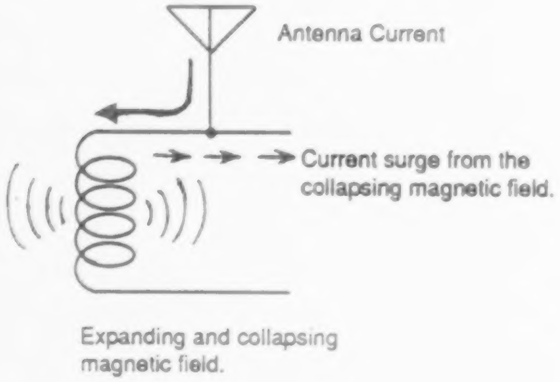

Antenna Current
Current surge from the collapsing magnetic field.
Expanding and collapsing magnetic field.

Fig.3 The inductor accepts current from the antenna

In short, the inductor accepts the current from theantenna, and stores it briefly as it builds magnetism.

When the magnetism reaches its maximum, it then collapses and pushes a current back into the circuit in the opposite direction. (The capability to temporarily store electrical energy as magnetism is measured with a unit called the Henry; the inductor in this circuit is measured in millihenries). The action-reaction of the inductor takes place many times a second. Each time the magnetic field collapses the inductor pushes current through the circuit and into the capacitor.

Capacitor

The capacitor is also designed to temporarily store electrical energy. Like the inductor, it can be electrically charged and discharged.

The capacitor is made of two plates each, connected to the circuit wires. The plates are separated by a nonconducting material, known as the dielectric; paper, glass or air are often used.

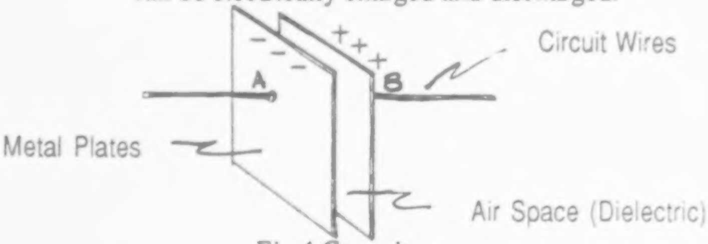


Fig.4 Capacitor

As current flows through the incoming circuit to plate A, a charge or excess number of negative electrons builds up on it. After reaching its maximum charge, the plate, unable to maintain this unstable state, discharges and causes current to flow in the opposite direction through the circuit.

The capacitor operates in a manner just opposite that of the inductor, however. When the inductor discharges, the capacitor receives its electrical energy and begins charging. When the capacitor is discharging, the inductor is charging and while the inductor is discharging the capacitor is charging, and so forth. When the capacitor is connected into the circuit in parallel with the inductor, the two parts complement one another. While they transfer energy equally to each other, like a swinging pendulum, the current in the circuit does run down gradually because of resistance in both the circuit wires and the component parts themselves. Much of the current also flows out of the circuit and on to the reproductive circuit as shown in Figure 5.

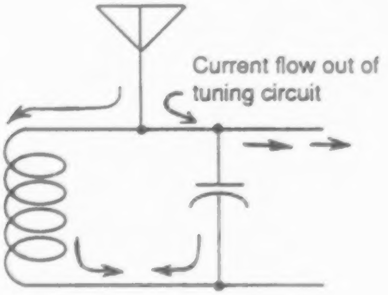


Fig 5 The tuning circuit: inductor and capacitor exchanging current

The capacitor's capability to temporarily store electrical energy is measured with a unit called the Farad. The circuit here is designed with a 150 picofarad capacitor. Pico is the metric prefix for one trillionth of a farad.

When the inductor and capacitor are connected, they become the radio tuner. If alternating current from the antenna is supplied to the inductor and capacitor, current begins to flow back and forth through the circuit. This back and forth flow is called oscillation. The frequency of the oscillations in the circuit is determined by multiplying the value of the inductor (L) times the value of the capacitor (C) within the following formula:

$$\text{Frequency of oscillations = the reciprocal of } \frac{1}{2\ \mathrm{II}\ LC}$$

For example, the circuit presented here uses a 358 microhenry inductor and a 150 picofarad capacitor. These values are placed into the formula and the equation solved:

$$\text{frequency of reciprocal} = \frac{1}{2\ \Pi\ \sqrt{LC}}$$

$$fr = \frac{1}{2\ (3.14)\ \sqrt{(358uh)(.00015uf)}}$$

$$fr = \frac{1}{(6.28)\ (18.92uh)\ (.0122uf)}$$

$$fr = \frac{1}{1.450 \text{ microhertz}}$$

$$f = 1.450 \text{ megahertz}$$

$$\text{frequency} \quad = 1\ 450\ kH_z$$

On the AM dial of your radio, the local radio station would be broadcasting at 1450 kH_z.

The radio station sending you the signal uses a similar inductor-capacitor hookup. The frequency of its signal is determined by the L x C of the transmitting station. If it is equal to the L x C of your tuning circuit you will be in resonance or "in tune" with the transmitter's signal. This is how your tuning circuit can select, from the many signals hitting your antenna, only the one that you desire.

Ground

Earlier, it was mentioned that a radio antenna receives many electromagnetic signals, all oscillating at different frequencies and all hitting on the antenna simultaneously. These signals range from approximately 300 kH_z to about 3 GH_z (see part 1). Therefore, the antenna is experiencing alternating current flow at many frequencies. The tuner eliminates all other flows of current because they are not in resonance with the selected inductor and capacitor. The inductor and capacitor were selected because they offer great resistance only to a desired frequency and thereby cause this current to can be considered a path of least resistance through which all frequencies not selected by the tuner flow. Ground is a wire from the circuit to the earth.

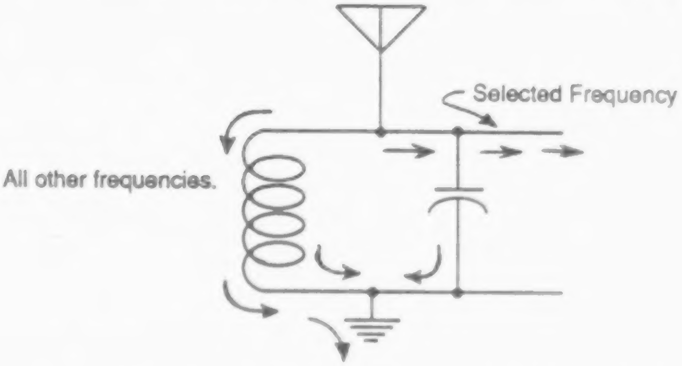


Fig. 6 The tuning circuit is made of four components

The Reproduction Circuit:

Diode

The next component placed into the radio receiver is called the diode. It plays a unique role. The diode is a device that conducts electrical current readily in one direction, but completely blocks its flow in the opposite direction. The diode component is the first of seven parts in the reproduction circuit. It can be thought of as a type of electrical one way street for electron flow. This is important because the remaining components in the reproduction circuit require current moving in one direction only.

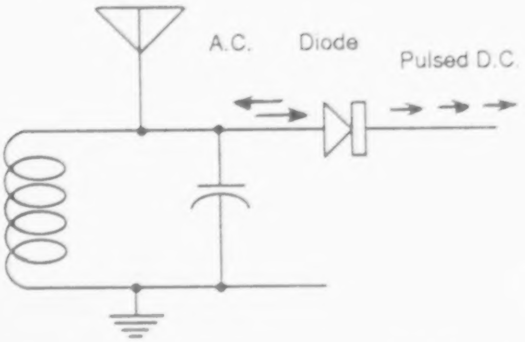


Fig. 7 The diode changes alternating current to pulsed direct current

The function of the diode is to change alternating current to direct current. You may recall that AC can be imagined as a stream of electrons flowing in one direction, abruptly halting, and then reversing to flow in the opposite direction. The number of times this cycle is repeated per second is called the frequency. As alternating current enters the diode, electrons can move from one terminal of the diode, through the diode to the other terminal very easily (see Fig. 7). However, when the current reverses, the diode acts as a high value resistor and completely blocks the flow in the reverse direction! Because the diode removes all of the reverse surges of AC current, the current coming out of the diode is one directional and in the form of a series of quick pulses(see fig. 7). Therefore, the current leaving the diode is referred to as pulsed direct current.

9 Volt Battery

You have probably realized by now that the current induced into the circuit by the electromagnetic signal being sent by the radio station's transmitter is extremely weak. It is far too weak to be detected by the ear phone so when the battery is placed in this circuit, it acts as the radio's power supply.

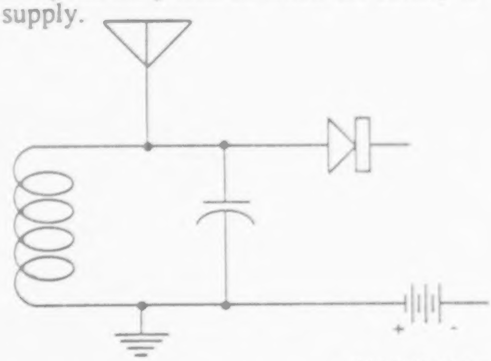


Fig.8 The 9 volt battery is the power source for the circuit amplifier-the transistor

Therefore, the 9 volt battery, when connected into the circuit provides increased voltage (electrical push) and increased current (volume of electron flow). This extra power is used to amplify the weak current already presented in the circuit enough to power the earphones. The circuit component that amplifies or increases the current in the circuit is called a transistor.

Capacitor #2

Like the tuning circuit, there is also a capacitor in the reproduction circuit. It is a 0.01 micro-farad capacitor. It is the second capacitor in the radio receiver circuit and is placed after the diode (see Fig. 9). The purpose of capacitor #2 is to negatively bias the transistor (see next section). This means about 0.7 volts of pulsed direct current prevents current flow in the reproduction circuit from reversing or flowing to ground. The capacitor, then, is a block that prevents current flow to ground.

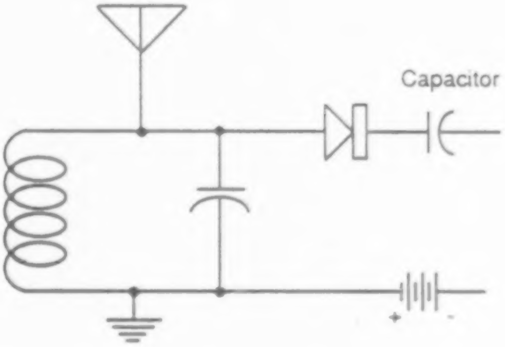
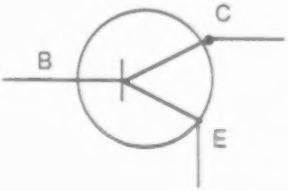


Fig 9 Capacitor #2 prevents current flow from the reproduction circuit to the tuning circuit



Transistor

The transistor is placed in the circuit by connecting it in series with the diode onto capacitor #2. The symbol for the transistor denotes that it has three important parts: the base (B), the collector (C), and the emitter (E).

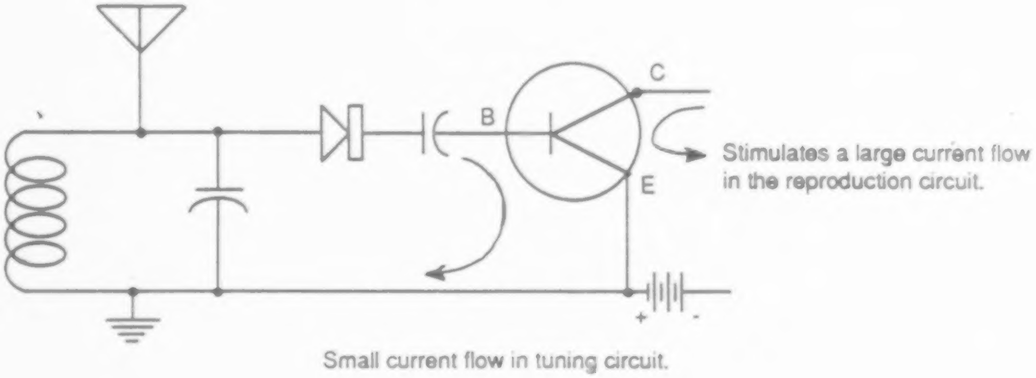

C
B
E
Stimulates a large current flow in the reproduction circuit.
+
-
Small current flow in tuning circuit.

Fig. 10 The transistor is on electrical amplifier

The modern transistor is very small. It is a semiconductor device that is so widely used that it has replaced vacuum tubes in most electronics applications. The transistor is made of three silicon layers each "doped" with impurities making them electrically positive (collector), negative (base) and positive (emitter). These differences allow the transistor to act as an amplifier because a very small amount of current (from the antenna) flowing into it results in a proportionately larger amount flowing out of it. Because its input current is small and its output current is proportionately large (up to a factor of 100 times greater!) it is appropriately termed an amplifier. Fig. 11 is an oversimplification of it, but the diagram does demonstrate the operation of the transistor. The small current flow induced by the radio signal in the left circuit controls the much larger flow through the large circuit. The region of the transistor known as the Base receives or collects a weak current from the antenna. This current activates a much larger and proportional flow of electrons coming from the 9 volt battery, and it flows through the entire circuit.

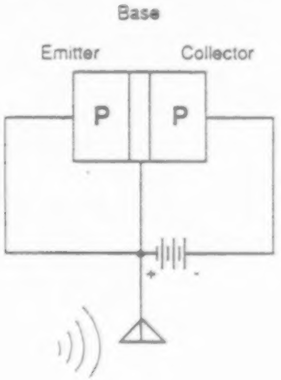
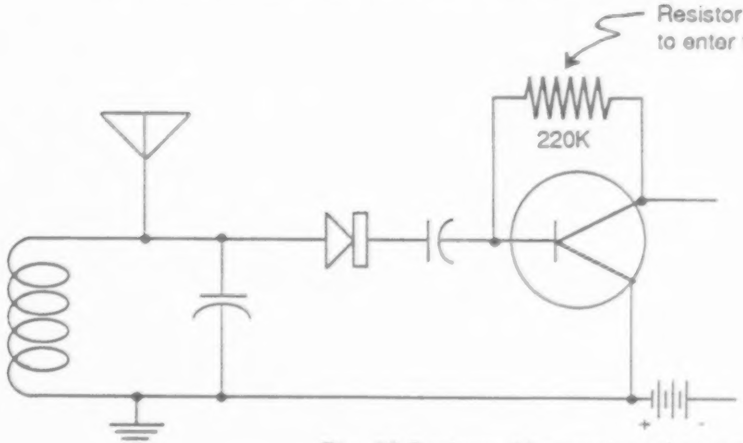


Fig. 11 A small current flow in the left circuit causes a large flow in the right circuit.

A thorough understanding of the transistor requires a deeper knowledge of physics, especially atoms and electrons. However, comparing it to a simple hand tool, a hammer, is helpful. Everyone knows that a nail driven half way into a large piece of wood is impossible to pull out by hand alone. By placing the claw end of the hammer below the head of the nail, it can easily be levered out. Only a small amount of energy, placed at the end of the handle, results in a proportionately much larger amount at the nail. The hammer amplifies the strength of your hand, just as the transistor amplifies the strength of the flow of electricity.

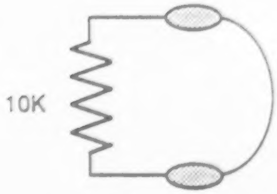
Resistor #1 A small 220K ohm resistor is placed into the circuit from Base to collector. Called resistor #2 in Fig. 12, it blocks most current flow but does allow a small amount to reach the base end of the transistor. This energizes the transistor, allowing it to work as an amplifier.



Resistor #1 allows a small amount of current to enter the base of the transistor

Fig. 12 Resistor #1 energizes the transistor

Crystal earphones and resistor #2



For the radio circuit presented here the earphones act as the radio speaker. The most important part of the earphone is the quartz crystal. By nature, the quartz crystal exhibits an amazing characteristic. When a flow of electricity is placed on it, the crystal is subject to physical stress; so much so, that it physically vibrates. This physical movement, in turn, is what causes sound, the same as that activating the radio transmitter back at the radio station.

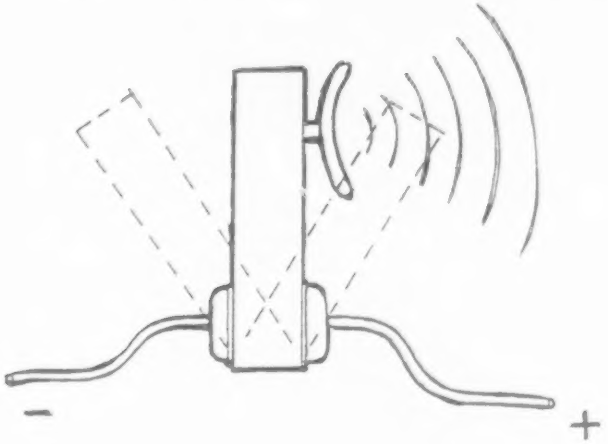


Fig. 13 The piezoelectric effect

The quartz crystal is connected into the circuit parallel with the 10Kohm resistor. (#2). As current is released from the 9 volt battery (triggered by the transistor amplifier), it

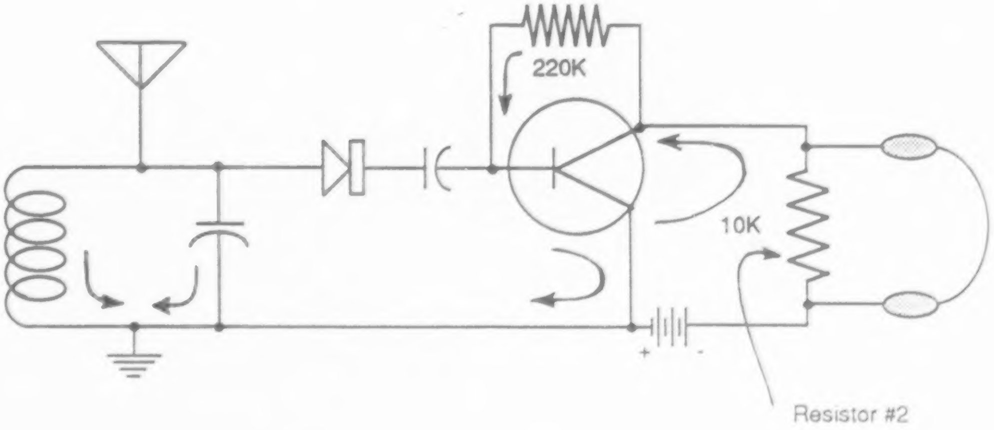


Fig. 14 Current flow in the completed radio circuit.

goes through resistor #2 as direct current (see Fig. 14). Current varies in proportion to the radio signal hitting the antenna; first it is strong then it is weak, then strong, then weak, and so on. Since these signals are changed to pulses of direct current by the diode, and amplified by the transistor, these surges of current can be converted to sound by the quartz crystal. Current cannot actually pass through the crystal because quartz is a nonconductor. Therefore, the 10Kohm resistor (#2 in Fig. 14) provides the path of least resistance through which the current can flow. As it does so, it creates a difference in the electrical polarity (number of electrons) on each side of the earphones. One becomes more negative with an excess of electrons, the other becomes more positive with fewer electrons. This difference causes the crystal to quickly bend back and forth. This is known as the "piezoelectric effect".

As surges of current coming through the circuit vary in intensity, the crystal also varies its rate of bending or vibrating. When the crystal is connected to a diaphragm, it will also vibrate, striking air molecules (see Fig. 13), and making them vibrate. These vibrating air molecules are what we call sound, a reproduction of the radio disc jockey's voice!

Name ___________________

Review Questions
Reading #2
Radio Circuit

The tuning circuit

1. Why does a radio receiver need an antenna?

2. Why does current flow first in one direction, then in the opposite direction, in a radio antenna?

3. What is the job of the tuning circuit?

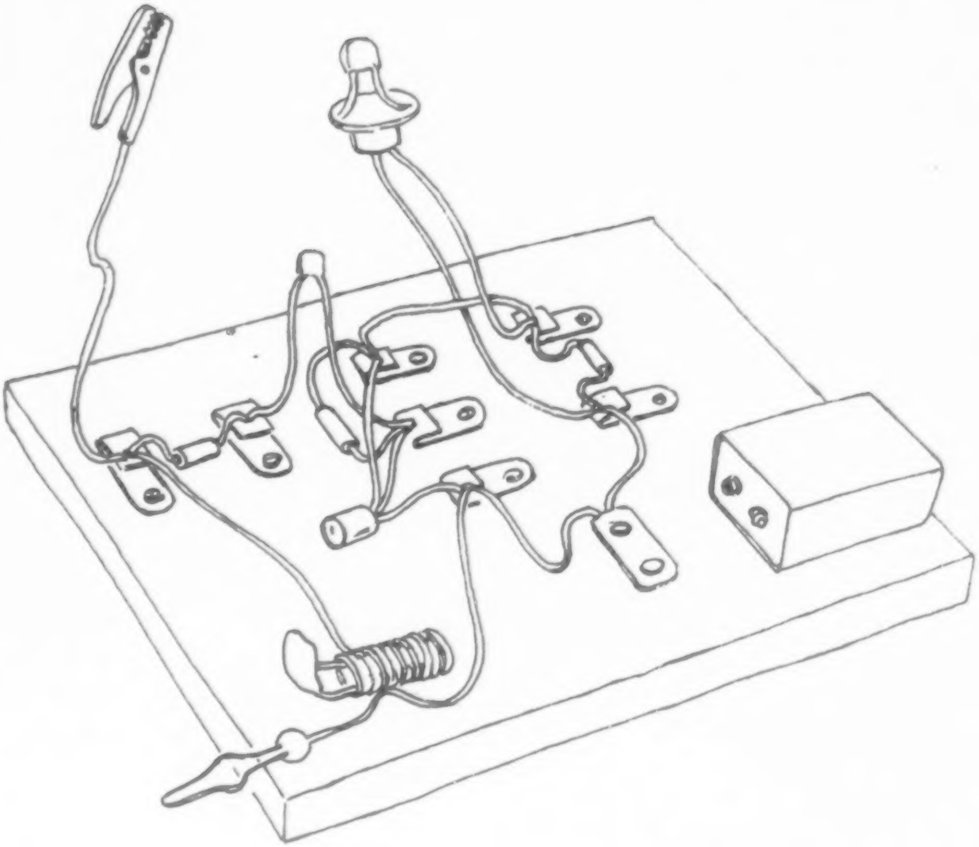
4. Describe the physical appearance of an inductor.

5. Explain how an inductor works.

6. Describe the physical appearance of a capacitor.

7. Explain how a capacitor works.

8. What is the function of ground in the tuning circuit?



Technology Activity Module 14

VIDEO
SYNCRACIES

by Mike Allen

Technology Activity Module 14

Instructor Component

Activity Objectives:

By using video equipment for television ad production, the learner will understand how ads are made and gain an appreciation for those seen on the networks. The process will allow hands-on experience with video cameras, VCR, lighting and staging, as well as picture composition, producing, writing, directing, and performance skills.

Target Competencies:

1. Demonstrate verbal and written skills in writing a script and directing a taping.
2. Identify the components of good composition.
3. Demonstrate the safe use of electronic or electrical staging equipment in the set-up, taping and tear-down of a video production.
4. Apply skills necessary to operate a camcorder and VCR for recording and editing video tapes.
5. Demonstrate the ability to determine the best lighting for camera work.
6. Formulate management skills in organizing, controlling and producing the video ad.

TAM Instructions:
Introduction

This TAM is intended to guide the students through the process of making an actual television ad. After the taping of an ad, the students will be more prepared to do TV production work--safety videos, video bulletins and many other activities in association with other departments and with the administration. The activities include: using video equipment, developing skills in communications, editing, lighting and staging, as well as pre- and post-tests.

Safety Considerations

Normal laboratory safety must be observed. When additional lighting is used in video taping, check for proper use of electrical outlets and be careful of burns from hot light bulbs. Also, one should be careful when working on ladders, changing bulbs, etc. When taping, be aware of all th electrical cords used to hook up recording equipment. These are only a few specific safety suggestions.

Needed Materials:

Supplies Required

a. Plain paper
b. Storyboard paper
c. #2 pencils
d. Adhesive tape
e. Blank video tapes
f. Masking tape
g. Magazines from which to clip still shots

Equipment/Machines/Tools

a. VCR with cables
b. Camcorder with tripod and hook-up
c. Scrim or appropriate background (an easel or tilting drafting board would be useful for still shots)

Optional:
d. 2nd VCR to edit video
e. Computer with video card or graphics generating capabilities
f. Editing controller

Handouts

a. Blank storyboard sheets of audio/image planners
b. Forced relationships paper (used to show how transitions are made using the least amount of time)
c. Sheet of television hand signals
d. Time chart for determining the number of words that can be spoken in a given time

Instructional Resources

a. Books

Macrae, Donald L., Michael R. Monty, and Douglas G. Worling. TELEVISION PRODUCTION: AN INTRODUCTION. 2nd ed. (Ontario, Canada: Methuen Publishing Company, 1981)

Breyer, Richard, and Peter Moller. MAKING TELEVISION PROGRAMS. 1st ed. (New York and London: Longman Publishing, 1984)

Gradus, Ben. DIRECTING: THE TELEVISION COMMERCIAL. 1st ed. (New York, NY: Hastings House Publishing, 1981)

Zettl, Herbert. TELEVISION PRODUCTION HANDBOOK. 3rd ed. (Belmont, California: Wadsworth Publishing, 1976)

Bond, Al. THE VIDEO HANDBOOK. 2nd ed. (New York, NY: Media Horizons Publishing, 1974)

b. Field trips to a local TV station to see TV ads being prepared would be beneficial.

c. Record TV ads from a variety of time settings to see how the ads are trying to reach each audience. Compare young Saturday morning audiences compared with adults on Saturday night and sports on Sunday afternoon for a general audience.

Management and Logistics Related TAMS

No TAMS are directly related; however, all are indirectly related because of the combining of audio and visual communications principles.

Evaluation and Grading

A two-part grading system should be used for the TV ad. The first part should include the objective test covering types of TV ads and the equipment used to make them. The second part should be subjective covering the actual work on presentation and taping of the ad.

Suggested Schedule

The longer the time given to the preparation of the ad the better; however, too much time will encourage the student to slack off prior to the actual taping. Usually a week is sufficient preparation time for a good ad. A bottleneck might be encountered in the actual taping of the ads since only two or three ads can be taped in one class period. It would be a good idea to put the students in teams of two or three for each ad. Alternate activities should be planned for those waiting or finished with their productions.

Key Instructional Suggestions:

Safety

Be sure to use all standard laboratory safety procedures along with the specific safety suggestion listed in the safety considerations.

Motivation

A field trip to the local TV station would be most helpful while students are making a commercial.

Prerequisite Information

The student should spend some private time watching and evaluating TV ads. A variety of time slots should be chosen to check for age and types of audience appeal.

Demonstration

a. Show an edited video tape of a variety of ads used on TV to help explain multifacated sides of an ad.
b. Demonstrate the proper technique for operating a camera.
c. Go through the various steps in the editing process.
d. Show correct equipment hook-ups.
e. Write an ad and read it in front of the camera to show why verbal skills are needed.
f. Video tape an action scene to show the importance of picture composition.

Attitudes

It must be understood that Rome was not built in a day. There may be failure but there will also be successes. Remember that even TV and film makers use re-takes to perfect the end product.

Remediation/Enrichment

During the activity the instructor should be "in tune" with "where the students are". If students seem confused, the target competencies should be reviewed.

Experience has shown that some slower students have a very good grip on visual skills. Perhaps students with good verbal skills could be placed with those with poor skills to give a good balance to the production.

You may want advanced students to experiment with more sophisticated procedures in the development of the production.

Summary and Review

a. Writing skills
b. Picture composition
c. Safety

d. Equipment skills
e. Lighting
f. Working with each other

Review Questions

1. What is the basic purpose for framing a shot?
   Answer: To show things as clearly as possible and to present them so they convey meaning and thought

2. How many words can most people successfully speak in 20 seconds?
   Answer: Forty-five words

3. How much video tape should you shoot?
   Answer: Enough to allow for clarity, meaning and thought with enough lead and lag to start and finish the editing procedure.

4. Why are management skills necessary?
   Answer: To guide others through a successful video taping experience

5. How much lead and lag time should be shot?
   Answer: From 5 to 10 seconds

6. If the color is dull on the video tape in comparison to the actual color, what can be done to correct the difference?
   Answer: Supply a more adequate degree of lighting

7. What kind of connectors are used on video equipment?
   Answer: BNC, "F", and RCA

Glossary

ANN. or ANNCR - announcer

Audio - the equipment used in the transmission and reproduction of audible sound; the range of audible sound waves; the sound that accompanies the visual portion of a television program.

Back light - light from above and behind the subject to give depth to the scene.

Backdrop - canvas or other suitable material, often painted, to provide background for a television production.

Picture composition - a pleasing, harmonious distribution of objects in the television shot.

Camera - a unit that contains an optical system and light-sensitive pick-up tube that converts a visual (optical) image into electrical impulses.

Character Generator (C. G.) - a unit with a typewriter-style keyboard which will produce lettering electronically on the television screen.

Close-up - a camera shot consisting of the head and shoulders of the subject with proper headroom.

Dolly - a stand equipped with wheels or casters on which a camera mount or microphone is supported.

Edit - the spot or location where two sections of program material have been joined together or other program material has been inserted of removed. To cut out or join program material together, physically or electronically, to change or improve a production.

Headroom - the clear space above the subjects head to the top of the screen.

Scrim - loosely woven material used as a staging device to divide a set or provide a background. A screen attached to the front of the lighting fixture to diffuse or soften the light.

Storyboard - a series of sketches illustrating the progressive shots in a program.

Video - the picture part of a television program.

Zoom- an apparent movement toward or away from a subject from a fixed camera position using a variable focal-length lens. Also called a zoom lens.

Pre-Assessment:

Directions: Answer true or false to the following questions.

T-F 1. Most people employed in the broadcasting industry are "behind the scene".

T-F 2. The television system consists of video and audio equipment for the production of general programming.

T-F 3. The television camera converts what it sees into electrical signals that are usually transmitted and reconverted by the television receiver into visible screen images.

T-F 4. The major production elements are: camera, lighting, audio, video tape recording, switching, post production, editing, special effects, and design.

T-F 5. Script must be translated into medium requirements through proper visualization and sequencing,or picturization processes.

T-F 6. People who appear on the television screen have varied communication objectives: some seek to entertain, educate, inform; others, to persuade, convince, or sell. Nevertheless, the main goal of each of them is to communicate with the television audience as effectively as possible.

T-F 7. The camera is the single most important piece of production equipment.

T-F 8. When shooting footage, always size up the situation before blindly shooting everything in sight.

T-F 9. The basic purpose in framing a shot is to show things as clearly as possible and present them so they convey meaning and thought.

T-F 10. Good picture composition can be learned, but it takes a lot of film footage and time to develop.

Post-Assessment:

A post test will find out what was learned during the instructional period. Therefore, reword and use the same questions as in the pre-test to have an accurate accounting of what was taught and learned.

Pre-Assessment Answers:

All the answers to the Pre-test are true.

Technology Activity Module 14

VIDEO SYNCRACIES

by Mike Allen

Student Component

Introduction:

Are you aware of what goes into making a commercial for television? Aware or not, you will be able to make an ad for television by following some simple instructions in this TAM. Up to now you have been watching the results of activity that went into the television ad. Now you will be directing the activity of ad production in creating an advertisement for a product or service.

Competencies:

1. Demonstrate verbal and written skills in writing script and directing a taping.
2. Identify the components of good picture composition.
3. Demonstrate the safe use of electronic and electrical staging equipment in the set-up, taping and tear-down of a video production.
4. Apply skills necessary to operate a camcorder and VCR for recording and editing video tapes.
5. Demonstrate the ability to determine the best lighting for camera work.
6. Formulate management skills in organizing, controlling and producing the video ad.

Module Overview:

Motivational Statement

Think of ads on TV that were really successful. Maybe it was something you were really interested in, or perhaps the ad was so exciting that you wanted the product or service it was trying to sell. You'll be able to put together a similar kind of ad by using the same techniques the ad people used.

Relationship to Context

Knowing how ads are put together--the equipment used and the decisions which are necessary--will help you become a better consumer in the advertising market.

Key Instructional Suggestions:

Class Presentations

1. History and impact of TV
2. Basic camera, recording, and play-back equipment
3. Lighting
4. Staging
5. Scripting
6. Picture composition

Demonstrations

1. Use of the camera
2. Use of the VCR for viewing and editing
3. Use of lighting
4. Ad set-up (how to set-up for a shooting)

Safety

1. Don't stand on top of a step ladder while working in the studio.
2. Make sure all wiring is in safe condition--no bare or kinked wires showing.
3. Beware of hot bulbs; let them cool before changing them.
4. Watch where you step in the studio because of wiring on the floor.
5. Make sure all lights are firmly attached so they won't fall while shooting the video.

Personal Activity

Actual work on the video should begin after you accomplish the following:

To make a good ad you should understand its basic components. View TV for the ads and write down the details of each ad. Ask yourself the following questions as you analyze each ad: What time of day they were run? What was the target audience? What was the length of the ad in seconds? What was the content of the ad? What special effects were used?

Needed Materials:

Supplies Required

1. Paper for making notation
2. #2 pencils
3. Adhesive tape
4. Masking tape
5. Duct tape
6. Magazines for still shots (any kind)
7. Blank video tape

Equipment/Machines/Tools

1. Camcorder
2. VCR
3. Necessary wiring
4. Appropriate lighting
5. Set materials (to match what is being videoed)

Handouts/Instructional Resources

1. Storyboard paper
2. Forced relationship papers
3. A variety of videotaped ads for viewing
4. Shot sequence paper
5. Post-test evaluation sheet--subjective format

Activity Sequence:

Instructor Start-up & Specific Instructions

Because equipment and teaching methods are not the same, you may need to adjust the plan of procedure to match your own environment.

Pre-Assessment:

The following questions should be answered before you begin the actual work on the ad:

1. Has the pretest been completed?
2. Have you studied the safety procedures?
3. Have you completed the written assignments?
4. Have you viewed all demonstrations?
5. Are you at ease using the equipment?
6. Did you successfully complete the picture composition activity?

Plan of Procedure

1. Select the theme of the ad. Ask yourself these questions before making a selection.
    a. What product or service am I wanting to advertise?
    b. What audience and age group do I want to reach?
    c. What is the length of the ad?
    d. What special effects will be needed?
    e. Will it fit within my ethical standards?

2. Using storyboard paper, sketch the scene necessary to convey the entire message of the ad. Look at the Forced Relationships handout; notice how you can jump from one scene to another without having to spend a lot of time making the transition. Usually, you start an ad with a problem to be solved and then solve it.

3. Cut out pictures from magazines or other sources to fulfill requirements for "still" shots. Remember, the picture must be large enough to be picked up by the camera. Also, for good picture composition, they should be as square as possible. Hand sketching can be used, also. The finished still pictures should be identified on the back and put in sequence on the storyboard. All should be camera-ready.

4. Add script to each picture, if necessary, and finish the ad "story". You may want to check with your speech or English teacher for help with grammar and word usage in scripting for the ad script. You should find them to be most helpful as you attempt writing for conciseness, clarity and continuity.

5. Make a dry run of the ad without equipment. Make sure the script parts are timed properly to go with each picture. Have a partner check this out with you. Make necessary corrections and re-time.

6. Now you are ready to make the first videotaping. Check to see that all equipment is prepared and working properly. Also, make sure all special-effects materials are ready to be used and that the lighting is correct. Make sure that people helping you know what must be done so they will be able to perform their tasks correctly.

7. After the first videotaping, view the tape to see that everything is done to your approval. If not, make refinements to the script, pictures, or other areas that would help get the message across.

8. Make a final videotape. This may require several re-takes to achieve the desired results. Don't give up until you are satisfied with the results.

Post-Assessment:

Evaluate the video by asking yourself these questions as you review the tape:
    a. Does it reach the proper audience?
    b. Does it flow from both the script and picture viewpoints?
    c. Was the lighting correct for all scenes?
    d. Does it meet time requirements?
    e. Were you able to direct all aspects of the videotaping to your satisfaction? If not, what should be changed?

Summary and Wrap-up

You should now have a greater awareness of the complexities in making a television ad. Your written and verbal skills were refined and put to good use in producing the ad. You also learned how to safely manipulate the equipment.

As you view television now, you will be more curious as to how the ad was put together and how they did some of the things that may have been a little tricky to do.

By participation in this activity you will become a more informed consumer of goods and services advertised commercially.

TV AD
PRESENTATION
EVALUATION FORM

Student Name____________________

AD TITLE _____________

AD LENGTH ___________

QUALITY OF ANNOUNCING (15 PTS.)

LIVE ACTION PERFORMANCE (10 PTS.)

SELECTION OF VIDEO PROPS (15 PTS.)

DIRECTING ABILITY (45 PTS.)

FINISH TIME ________

START TIME________

TOTAL TIME________

ADDITIONAL COMMENTS:

SCORE__________

SHOT SEQUENCE

PROGRAM: ______________________

DATE: __________________________

SHOT DETAIL	LIVE/CANNED	TIME	ELAPSED TIME
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
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18.

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21.

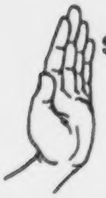
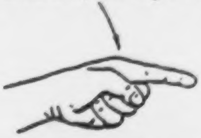
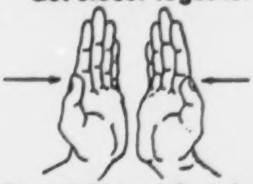
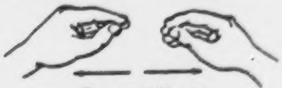
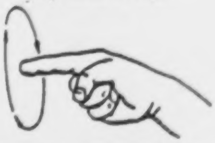
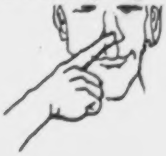
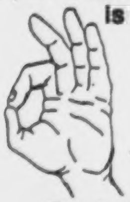
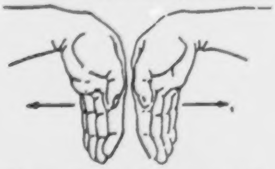
22.

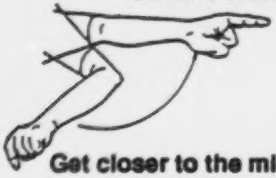
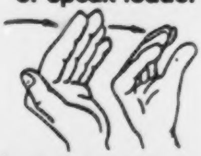
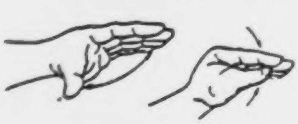
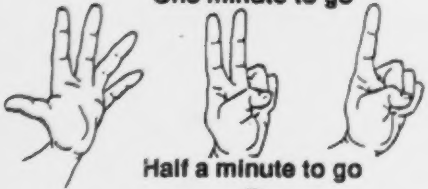
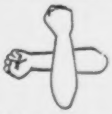
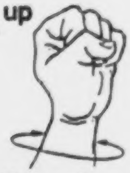
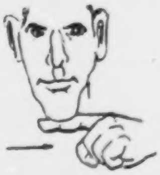
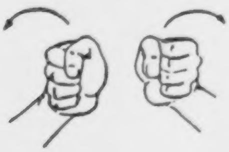
23.

24.

25.

Television Hand Signals

CUE	MEANING	DESCRIPTION
Stand by 	Ready to start show Ready to record Quiet on the set	*Raise hand in air, with fingers pointing upward*
You're on, take your cue 	Start talking Talent is on the air	*Point to performer or live camera*
Get closer together 	Talent, performer, or reporter is too far apart. Get closer together. Get closer to object of interest	*Play an invisible accordian, bringing palms together repeatedly*
Stretch it out, slow down 	Talking too fast	*Move hands as if pulling taffy apart or stretching rubber bands*
Speed it up 	Talking too slow Running out of time	*Move forefinger in circles*
On the nose, program on time 	Program is running right on time No problems	*Touch nose with forefinger*
OK, all is well, your position is fine 	Well done Stay right there	*Form an "0" with thumb and forefinger with other three fingers raised.*
Get further apart 	Talent too close together	*Move hands together, back to back, then spread them sharpley apart.*
Stop, that's far enough	Close enough or far enough, stop moving together or apart	*Traffic cop's signal, similar to "stand by" signal*

CUE	MEANING	DESCRIPTION
Talk to this camera **Camera change** 	Changing cameras	*Swing hands through a wide arc from camera that is on the air to the camera that will be on the air.*
Get closer to the microphone or speak louder 	Audio level too low Get closer to microphone	*Move hands toward himself/ herself or toward the microphone.*
Get further from the microphone or speak lower	Audio level too high Move away from microphone	*Move hand away from self or away from the microphone.*
Keep talking, stretch 	Too much time left, fill in	*Extend thumb and forefinger horizontally, move them like the beak of a bird.*
Five minutes to go **Two minutes to go** **One minute to go** 	Time cues to end of show	*Raise hand with corresponding number of fingers spread apart or raise flash cards.*
Half a minute to go 	Time to end of segment or end of show	*Cross forefingers or forearms at midpoint.*
Wrap it up 	Ten seconds left, come to conclusion	*Rocking or shaking of clenched fist*
Cut, finish, off the air 	Segment or show is over	*Slash throat with forefinger or edge of hand.*
Station break (I.D.) 	Commercial	*Motion like breaking a twig is made with clenched fists.*

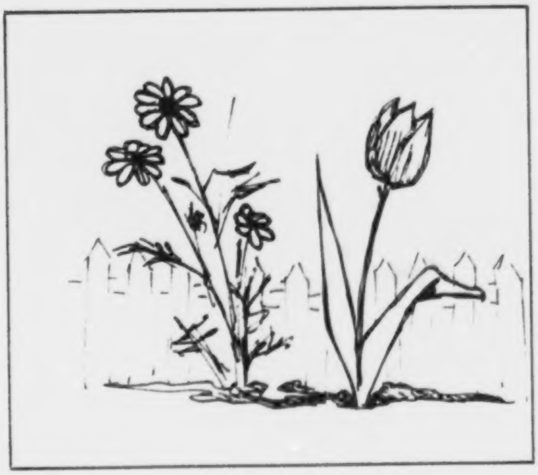
STORYBOARD

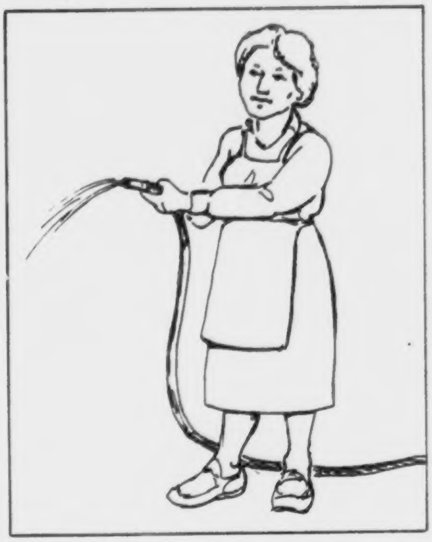
NAME: ______________________________

Forced Relationships

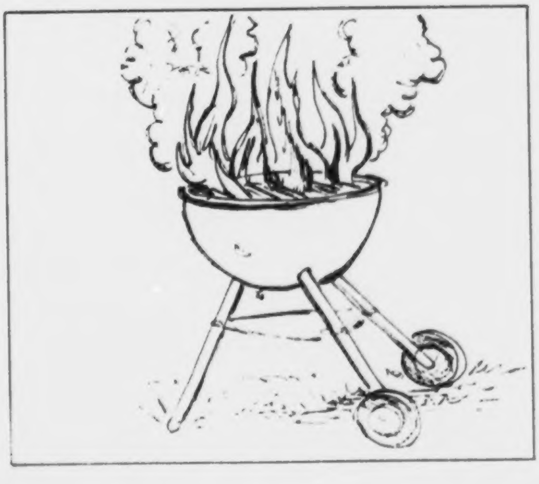
Cuts are able to make persons, places, and things seem related, even when they are not. What the viewer sees often depends upon the mental connection between shots.

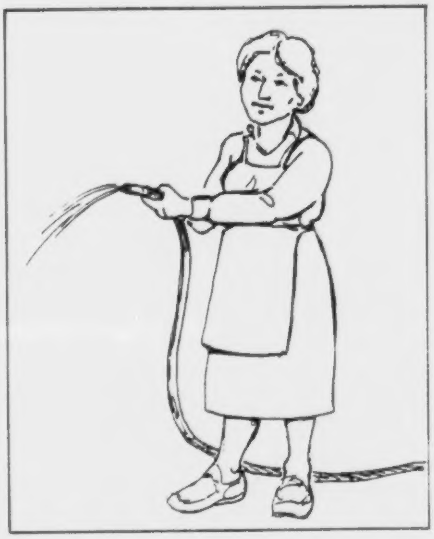
Look at the first frame below. It shows a flower garden. Write what you think the second frame shows.





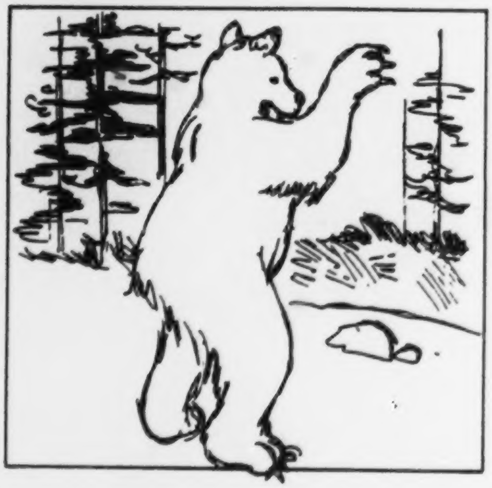
You probably assumed that the woman in the second frame is watering her flower garden. This can be altered, however, by changing the first shot. Write what you think the second shot shows this time.

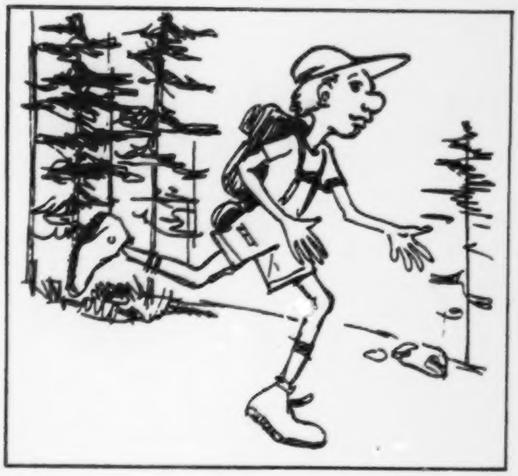


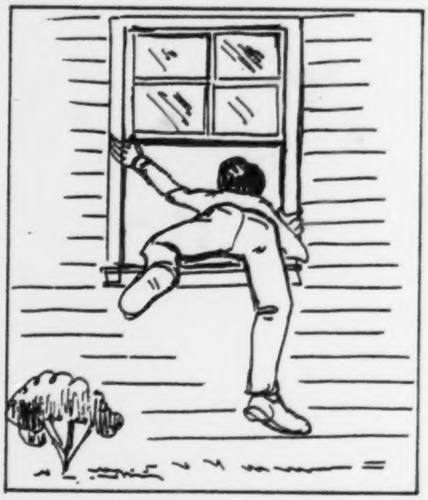


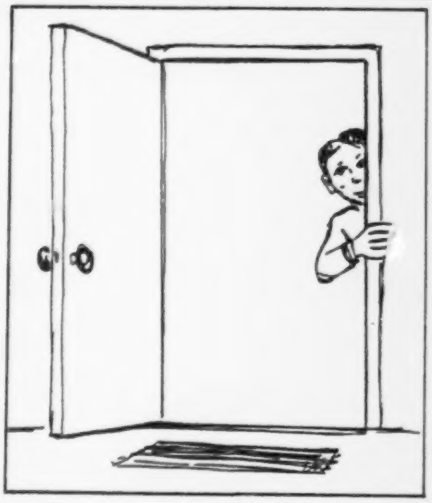
Now the woman might be trying to douse the flames burning up her barbeque!

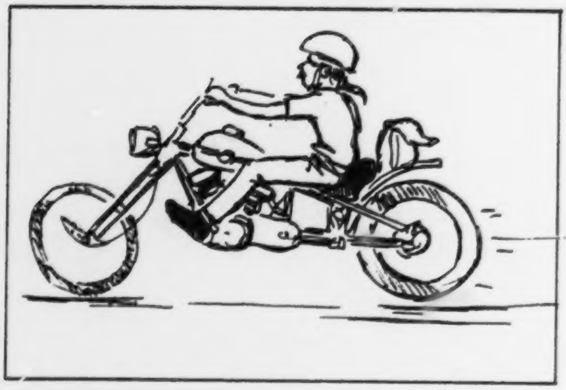
Look at the pairs of shots on the following page and write what you think the second frame shows in relation to the first frame.

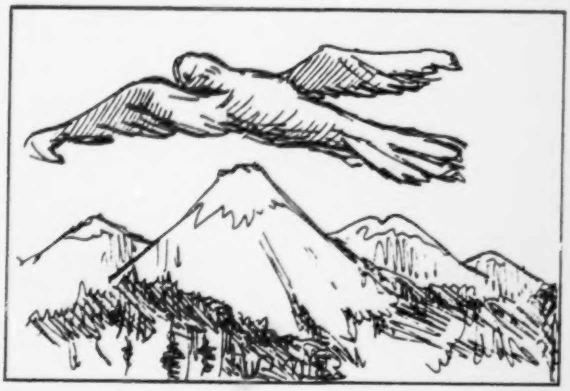












Technology Activity Module 15

JOB HUNTING SKILLS

by Dan Stephens

Instructor Component

Activity Objectives:

The purpose of this TAM is to develop an awareness of potential career opportunities available in the communication technologies. It will also help students develop skills necessary to appropriately present themselves and their credentials to a prospective employer.

Target Competencies:

After finishing this TAM, students will:

1. Have an opportunity to see people at work in the communications industry and hear them describe their job responsibilities.
2. Become familiar with their own interests and abilities in possible fields of employment.
3. Be able to identify and describe potential occupations in the communications industry.
4. Develop and write career goals for the future including type of job, skills required, training necessary, where training is available, steps on the career ladder to reach target job, and the anticipated time frame to reach the goal.
5. Acquire and develop skills in locating and securing employment.
6. Explore career options in the area of communications that are available in the surrounding communities.
7. Know where to find lists of schools to train for a particular career.
8. Determine and list at least five characteristics an employer seeks in an employee.

9. Use a model resume as a guide and write a personal resume to be used in applying for a job in a mock interview.
10. Become proficient at filling out a job application.
11. Acquire an understanding of how to present oneself to a prospective employer in a job interview.
12. Experience interviewing for a job through participation in a mock interview in class.

TAM Instructions:

Introduction:

This TAM has been designed to be used in a sequence of five steps. Available time and resources may limit how many of the steps are actually completed. The five activities can be used in order, or individual activities may be used as the instructor sees fit. The school's guidance counselor can be of great assistance in providing information for several of the activities in this TAM.

Safety Considerations

The field trip activity in this TAM may require special safety instruction. Remind students of safety considerations during transportation and while touring the business. Instruct them not to touch any equipment inside the business and to closely follow any instructions given by the host.

Needed Materials:

Supplies

In each of the activities listed below, the school guidance counselor can provide current books and brochures that may supply ideas in addition to the ones presented in this TAM. Consultation with the school guidance counselor before beginning this TAM may be very helpful.

Activity 1: Field Trip
    Transportation for class to destination
    Materials for students to take notes on (notebooks)

Activity 2: Interest/Aptitude Test
    Examples: SIGI, Strong Campbell Interest Inventory,
    Kuder Interest Inventory, Armed Services Vocational Aptitude Battery (ASVAB),
    or Discover.

Activity 3: Communications Job Availability and Description
    Metropolitan newspaper "Help Wanted" advertisements
    Small town newspaper "Help Wanted" advertisements
    Dictionary of Occupational Titles
    Occupational Outlook Handbook
    The College Blue Book, Vol. 1-3
    Peterson's Guide To Four-Year Colleges

Activity 4: Preparing a Resume
  Sample resumes (end of TAM)
  Resume checklist (end of TAM)
  Access to word processor or typewriter
  How to Get Your First Job

Activity 5: Applying and Interviewing for a Job
  Job application forms (end of TAM)
  Completed resume from Activity 4
  Interviewing tips (end of TAM)
  Sample interview questions (end of TAM)
  How to Get Your First Job

Equipment Machines/Tools

Activity 1: School bus
Activity 4: Word processor

Handouts

Activity 4: Career Resume Checklist, sample resume
Activity 5: Tips on interviewing, sample interview questions

Instructional Resources

THE COLLEGE BLUE BOOK (New York, NY: MacMillan Publishing Co., 1990)

Peterson's Guides, PETERSON'S GUIDE TO FOUR-YEAR COLLEGES. (Princeton, NJ: Peterson's Guid, Inc., 1990)

U.S. Department of Labor, DICTIONARY OF OCCUPATIONAL TITLES (Washington, D.C.: U.S. Government Printing Offices, 1989)

U.S. Department of Labor, OCCUPATIONAL OUTLOOK HANDBOOK. (Washington, D.C.: Bureau of Labor Statistics, 1989)

Elsman, M. HOW TO GET YOUR FIRST JOB (New York, NY: Crown Publishers, Inc.)

Management and Logistics
Related TAM

The experience acquired in the other TAMS may have given students an idea of the types of careers that are available in the communications industry. Also, exposure to previous TAMS may have generated an area of job interest for some of the students.

Evaluation and Grading

The grading system below is recommended only for activities 1-5 and the post-test are completed as a unit. Because most of the activities cannot be graded against a list of criteria, but rather on the instructor's personal judgments, the following method has been devised:

Each activity is to be graded with a:

+ above average	+ = 4 pts
√ average	√ = 2 pts
- below average	- = 1 pt
0 failed to complete	0 = 0

Total the point scores and divide by 5.

18-20 pts = A
16-17pts = B
14-15pts = C
12-13pts = D
11 or less = F

The test grading scale is as follows:

18-20 pts = A
15-17 pts = B
12-14 pts = C
10-11 pts = D
9 or less = F

The Unit Grade = (Activity Grade X .80) + (Test Grade X .20)

Suggested Schedule

The projected time frame for individual activities is listed below in terms of classroom days, although some activities may require more days outside of the classroom. (Completion of all five activities in sequence is expected to take seven to ten classroom days.) These are only projected time frames.

Activity 1: two days
Activity 2: one day
Activity 3: two days
Activity 4: two days
Activity 5: one to three days

Key Instructional Suggestions:

Safety

The field trip activity in this TAM may require special safety instruction. Remind students of safety considerations during transportation and while touring the business. Instruct them not to touch any equipment inside the business and to closely follow any instructions given by the host.

Motivation

Presenting the information such that students can see how it applies in their lives is essential. It should be pointed out that each student could have a practical use for this information at the present time as well as later in life.

Prerequisite Information

None

Presentation of Activities

Activity 1: Field Trip (This activity addresses Target Objectives 1 and 2.)

Make arrangements to tour a local communication-oriented business. In a small community the local newspaper might be available to tour, while in a larger community there may be several choices such as newspapers, phone company, TV stations, radio stations, printers, and so on. Explain that the purpose of the trip is to make students aware of job opportunities in the communications field. Obtain permission to ask if employees at their workstations could explain what they are doing and what their job responsibilities are. Request your host to speak to the class after the tour. Ask that the comments are targeted to explain some of the entry-level skills and the progression up the career ladder.

Upon return to the classroom, encourage class discussion of the processes observed and list the jobs seen. Also, discuss the educational requirements of the jobs, the qualifications required and the opportunities for advancement.

Activity 2: Interest/Aptitude Test (This activity addresses Target Objective 2.)

In this activity the school guidance counselor may be able to provide helpful information and assistance. The counselor may have books and other resources on hand that will help students in evaluating their occupational interests. In addition, the counselor might have access to interest inventory tests and aptitude tests. These tests are designed to assess interests or potential abilities in different occupations. Some of these tools are computerized programs designed to find the ideal career for a person through matching interests and abilities. Examples that may be available in your school are:

Strong Campbell Interest Inventory
Kuder Interest Inventory
Armed Services Vocational Aptitude Battery
SIGI
Discover
Moview

It may be beneficial to recruit the help of the counselor for administering, scoring and evaluating the completed tests. Students will be required to make an appointment with the counselor to take the test, or the tests may be administered to the class as a whole. Depending on the test used, it may be necessary for the guidance counselor to interpret the results for each student.

Information gathered in this activity will promote an awareness of potential areas of occupational interest. Also, the information that students discover about themselves may be useful in Activities 3 and 5.

Activity 3: Communications Job Availability and Descriptions (This activity addresses Target Objectives 4, 5, 6, and 7.)

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Begin this activity by having the class brainstorm and list the many careers in the communications field. Each class member needs to make a copy of the list for reference in the take-home assignment. Instruct them to search the "Help Wanted" section of the newspaper to see how many communication jobs they can identify. Have them record their findings and bring the list to class for discussion. A copy of the want ads may be helpful. It is important for them to realize that there may be many more jobs than just the ones the class listed on the board. Location of job availability can be demonstrated by assigning them to search two papers, one major newspaper and one hometown newspaper.

Assign each student to research one of the jobs they found listed in the "Help Wanted" Ads, write a description of the training required, where it can be received, the responsibilities involved in the position, opportunities for advancement, and the expected starting pay. This information can be found in The Dictionary of Occupational Titles, The Occupational Handbook, Peterson's Guide to Four-year Colleges, and The College Blue Book, vol. 1-3. These books can be found in the counselor's office or in the school library. Also, the guidance counselor should have catalogs from universities and vocational schools describing programs available. The information recorded here needs to be saved for use in Activities 4 and 5.

Activity 4: Preparing a Resume (This activity addresses Target Objective 9.)

Upon completion of this activity, the student will have a simple personal resume to use in applying for a job. A resume is a condensed statement of a person's qualifications and abilities. The resume of a high-school student looking for a part-time job will obviously be different from that of an adult who is searching for a career position. Located in the appendix are a sample resume to be used as a model in this activity and a career resume checklist. The distinction between a part-time job and a career should be made apparent to the students. The parts of the career resume check list, in conjunction with the model resume, can be used by the students to develop their personal resumes.

After developing and formatting the resume, the class can be assigned to print it in an acceptable manner for presentation to a prospective employer. Depending on the facilities in your school, students can be assigned to type the resume or use a computer in the communications lab or school computer lab. This part of the assignment may best be completed by assigning people to work in pairs or small groups with the entire class in the lab at the same time. This will allow students to exchange ideas while working together. The feasibility of this method may be dependent upon the facilities available. The resumes produced can be used in activity 5.

Activity 5: Applying and Interviewing for a Job (This activity addresses Target Objectives 5, 8, 9, 10, 11, and 12.)

At some point in their lives, all students will apply and interview for a job. Whether they are applying and interviewing for a part-time job while in high school or a career after graduation, Activity 5 can be very helpful. A good reference for this activity is Max Elsman's How to Get Your First Job. This book has information for high school students pertaining to applying and interviewing for a job.

Students may apply to the instructor through a mock interview for a position discovered and researched in Activity 3. Allow the student to choose the position they wish to pursue. Require each student to fill out the job application provided at the end of this TAM. Below are some helpful tips on filling out a job application in a real-life setting.

1. Carefully read the entire application from beginning to end before filling it out.
2. Fill it out in pen. (Bring a pen with you so you don't have to ask to borrow one.)
3. Dress appropriately to make a good first impression.
4. Fill out all the questions on the application. If a question does not apply, write N/A.
5. Print legibly.
6. Be neat. If you make a mistake ask for another application, double-check spelling.
7. Be truthful in your answers.

The personal resume developed in Activity 4 will be used in the interview. The student needs to present the completed application and the resume to the instructor as though he or she was actually applying for a job. The instructor should ask questions as an employer would when interviewing a prospective employee. Sample interview questions are to be provided to the student and used as a guide for the instructor during the mock interview. It is important for the students to recognize characteristics an employer looks for in an employee. Example characteristics desired of employees include:

1. Good personal appearance
2. Knowledge of business or position
3. Trustworthyness
4. Self-confidence
5. Promptness
6. Cleanliness
7. Ability to communicate effectively
8. Courteous attitude
9. Attention to details
10. Getting along with others
11. Willingness to learn

Reinforcement

Since most of the components of this TAM are not evaluated with a letter grade, it is important students be praised verbally. This praise can be used as a motivator for under-achievers, as well as a reward for those who do well.

Attitudes

Develop an attitude of curiosity about career options in the communication fields.

Summary and Review

Upon completion of this TAM, students will have an increased awareness of communication-related jobs. This learning experience will also provide students with a basic understanding of their own occupational interest, how to apply for a job, and how to present themselves in a job interview. Some students may also begin to develop an awareness of potential options for post-high school education.

Review Questions

Class review before the test could be conducted by asking general questions about the twelve target competencies. These questions should be used to promote class discussions pertaining to the objectives listed.

Glossary

Aptitude test - evaluates one's abilities in an occupation or ability to learn an occupation.

Armed Services Vocational Aptitude Battery (ASVAB) - test developed by the armed services to assess individual aptitudes.

Career - profession for which one trains and which is undertaken as a permanent calling.

Career Ladder - the progressive steps of advancement to reach an occupational goal.

Discover - a computer program designed to help assess personal aptitudes.

Interest Inventory - a test to identify areas of occupational interest.

Kuder Interest Inventory - a test to assess individuals' occupational interests.

Job - activities engaged in to produce a source of income.

MoView - a computer program presenting information on job possibilities, salaries, and educational requirements in the state of Missouri.

Resume - a condensed statement of a person's occupational skills, experience, and abilities.

SIGI - a computer program used to assess skills, interests and abilities in an individual and project the ideal career for that person.

Strong Campbell Interest Inventory - a test to assess an individual's occupational interests.

Pre-Assessment:

The pre-assessment will hellp determine which activities to concentrate on. The pre-test can be found at the end of this TAM, and the answer key is indicated below.

1. A test taken to identify areas of occupational interest

2. A test to evaluate one's abilities in an occupation or ability to learn an occupation

3. Many possible acceptable answers

4. Progressive steps of advancement to reach one's occupational goals

5. Good personal appearance
   Knowledge of business or position
   Promptness
   Ability to communicate effectively
   Attention to detail
   Getsting along with others
   Trustworthiness
   Self-confidence
   Cleanliness
   Courteous attitude
   Willingness to learn

6. Condensed statement of a person's occupational skills, experiences and abilities

7. Yes or No

Post-Assessment:

The post-assessment is given in the form of a written test. The test can be found at the end of the TAM; the answer key is below.

1. A test taken to identify areas of occupational interest

2. A test to evaluate one's abilities in an occupation or to learn an occupation

3. Many possible acceptable answers

4. The progressive steps of advancement to reach one's career goals

5. Good personal appearance
   Knowledge of business or position
   Promptness
   Ability to communicate effectively
   Attention to details
   Getting along with others
   Trustworthiness
   Self-confidence
   Cleanliness
   Courteous attitude
   Willingness to learn

6. Personal identification
   Title of position you are seeking
   Experience
   Education
   Personal statistics
   Miscellaneous

7. The College Blue Book , Peterson's Guide To Four-Year Colleges

8. The Occupational Outlook Handbook, The Dictionary of Occupational Titles

Technology Activity Module 15

JOB-HUNTING SKILLS

by Dan Stephens

Student Component

Introduction:

Many Americans are employed in the communications industry. Radio, TV, newspaper, photography, computer, telephone, satellite, and printing are just a few industries in communications. Because our country is so reliant upon fast, accurate transmission of information, many job opportunities are present. Through this TAM you will be able to gain some insight as to some of the occupations available and how to proceed in securing a job.

Competencies:

1. Have an opportunity to see people at work in the communications industry and hear them describe their job responsibilities.
2. Become familiar with one's own interests and abilities in possible fields of employment.
3. Be able to identify and describe potential occupations in the communications industry.

4. Develop and write career goals for the future including type of job, skills required, training necessary, where training is available, steps on the career ladder to reach target job, and the anticipated time frame to reach the goal.
5. Help students acquire and develop skills in locating and securing employment.
6. Explore career options in the area of communications that are available in the surrounding communities.
7. Know where to find lists of schools to train for a particular career.
8. Determine and list at least five characteristics an employer seeks in an employee.
9. Using a model resume as a guide, write a personal resume and use it to apply for a job in a mock interview.
10. Become proficient at filling out a job application.
11. Acquire an understanding of how to present oneself to a prospective employer in a job interview.
12. Experience interviewing for a job through participation in a mock interview in class.

Module Overview:

Motivational statement

The information presented in this TAM will be very useful in accomplishing your career goals after graduation. However, it is not uncommon for students during their high school years to have some type of employment. The information and skills acquired in this TAM will give you the edge over other people applying for the same job. After successfully completing this TAM, you will have the background to make yourself a much more attractive applicant than a person without an understanding of this information. Successful completion of these activities could mean the difference between getting the job and someone else getting the job for which you applied.

Key Instructional Suggestions:

Class Presentations

During the course of this TAM, key concepts will be presented and discussed in class. Also, through activities the class as a whole participates in, key information will be presented. To successfully complete the TAM it will be necessary to take notes over key information which will be used later in activities. Some of the key information will be presented in the form of a handout.

Demonstrations

Observe the demonstrations presented by your teacher.

Safety

Your teacher will instruct you on transportation safety policies before leaving for the field trip in Activity 1. While inside the business you are touring, do not touch any equipment and closely follow any instructions given by your host.

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Needed Materials

Supplies

Activity 1: Field Trip
- Materials for students to take notes on (notebooks).

Activity 2: Interest/Aptitude Test
- Examples: SIGI, Strong Campbell Interest Inventory, Kuder Interest Inventory, Armed Services Vocational Aptitude Battery (ASVAB), or Discover.
- Pencil

Activity 3: Communications Job Availability and Description
- Metropolitan newspaper "Help Wanted" ads
- Small town newspaper "Help Wanted" ads
- Dictionary of Occupational Titl34s
- Occupational Outlook Handbook
- The College Blue Book, Vol. 1-3
- Peterson's Guide To Four-Year Colleges
- How to Get Your First Job

Activity 4: Preparing a Resume
- Sample resumes
- Resume checklist
- Access to word processor or typewriter

Activity 5: Applying and Interviewing for a Job
- Job application forms
- Completed resume from Activity 4
- Interviewing tips
- Sample interview questions

Equipment/Machines/Tools

Activity 4: A word processor is needed for this activity.

Handouts/Instructional Resources

Activity 1: Field Trip
- Transportation for class to destination
- Materials for students to take notes on (notebooks)

Activity 2: Interest/Aptitude Test
- Examples: SIGI, Strong Campbell Interest Inventory, Kuder Interest Inventory, Armed Services Vocational Aptitude Battery (ASVAB), or Discover.

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Activity 3: Communications Job Availability and Description
- Metropolitan newspaper "help wanted" ads
- Small town newspaper "help wanted" ads
- Dictionary of Occupational Titles
- Occupational Outlook Handbook
- The College Blue Book, vol. 1-3
- Peterson's Guide To Four-Year Colleges

Activity 4: Preparing a Resume
- Sample resumes (end of TAM)
- Resume checklist (end of TAM)
- Access to word processor
- How to Get Your First Job

Activity 5: Applying and Interviewing for a Job
- Job application forms (back of TAM)
- Completed resume from Activity 4
- Interviewing tips (back of TAM)
- Sample interview questions (back of TAM)
- How to Get Your First Job

Activity Sequence:

a. Pre-test
b. Completion of activities:
  Activity 1: Field Trip
    This activity is designed to raise your awareness of local communication-related occupations.

  Activity 2: Interest/aptitude Test
    Completion of one of the interest/aptitude tests listed will help to create an awareness of your particular occupational interests.

  Activity 3: Communications, Job Availability and Description
    This activity will give you some insight into the jobs in communications that are available, including their salaries, locations, educational and experience requirements.

  Activity 4: Preparing a Resume
    A knowledge of how to write a personal resume to properly present yourself in a job interview will be gained from completing this activity.

  Activity 5: Applying and Interviewing for a Job
    This activity will give you first-hand experience in how to fill out a job application form and interview for a job. This experience will be very beneficial to those students seeking employment soon.

c. Post-test

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Summary and Wrap-up

Finding a satisfying and reasonably well-paying job is one of the most important challenges for every high school student. The purpose of this TAM was to show you some methods for finding jobs.

CAREER RESUME CHECKLIST

Categories of Information

1. Personal Identification
   - Name
   - Address
   - Phone Number
2. Title of Position Seeking
3. Experience
   - Inclusive dates
   - Names and Addresses of Employers
   - Your Job Title
   - Description of Duties
4. Education
   - Name of College or University
   - Dates of Attendance
   - Degrees and Honors Achieved
5. Personal Statistics
   - Age
   - Marital Status
   - Height and Weight (optional)
   - Military Experience
   - Organizations and Affiliations
6. Miscellaneous
   - Availability for Travel
   - Relocation Preference

Resume Guidelines

*Do not exceed one page

*Minimize personal information

*Use quality 8.5" x 11" paper

*Make it graphically pleasing

*Highlight skills and capabilities

*Proofread to eliminate errors

*Use action verbs to describe duties

*Use underlining to emphasize skills

*Use a letter-quality printer

*Avoid using "I"

*Reproduce professionally by offset or laser printing

*Avoid self-flattering descriptions

*Be honest and accurate

*Review final draft with counselor or friend

*Stress accomplishments

*Know your audience

*Proofread again

Name ____________________

JOB HUNTING SKILLS
PRE-TEST

1. What is an Interest Inventory Test?

2. What is an Aptitude Test?

3. List six careers in the communications industry.

4. Define the term career ladder.

5. List five characteristics an employer looks for in an employee.

6. What is a resume?

7. Have you ever applied for a job before?

Name ____________________

JOB HUNTING SKILLS
POST-TEST

1. What is an Interest Inventory Test? 1 pt.

2. What is an Aptitude Test? 1 pt.

3. List six occupations in the communications industry. 6 pts.

4. Define the term career ladder. 1 pt.

5. List three of the six categories of information on a resume. 3 pts.

6. List six characteristics an employer looks for in an employee. 6 pts.

7. Name a book that lists programs of study at the college level. 1 pt.

8. Name a book where information on occupations can be found. 1 pt.

SAMPLE INTERVIEW QUESTIONS

1. Tell me a little about yourself.

2. Why do you want to work in this field (job)?

3. How would you improve the design of a giraffe?

4. Which of your accomplishments give you the most satisfaction and why?

5. What are your greatest strengths?

6. What are your weaknesses?

7. What contributions could you make to the job you seek?

8. Why should I hire you?

9. Give me an example of a major problem you've solved.

10. What is more important to you--salary or the job itself?

11. Are you willing to relocate?

12. What would you like to be doing in five years?

13. How much do you expect to be earning in five years?

14. What do you do in your free time?

15. Can you supervise people? How do you know?

16. Are you prepared to travel?

17. What are your long-term goals?

18. How quickly do you feel that you will be able to contribute to this department?

19. How were your grades in college? (Why were they that low?)

20. What people in life do you most admire?

21. Describe your relationship with your last supervisor.

22. Why didn't you return to the company that you worked for during the summer?

23. This job requires some skill in computers. How do you feel about working with computers or other technical equipment?

24. Why did you want to interview at this company?

25. What is your minimum salary requirement?

TAM #15: Job Hunting Skills
Missouri Introduction to Communication Technology Guide, 1990

TIPS ON INTERVIEWING

*Research the company

*Appearance is crucial

*Timeliness

*Resumes and writing samples

*Make allies of everybody

*Consider the interviewer's problem

*Concentrate on first impressions

*Eliminate nervous mannerisms

*Names are important

*Smoking may be dangerous to your career

*Show self-confidence

*Show sense of worth

*Let interviewer control first interview

*Never bad mouth anyone

*Contain emotions

*Speak out when necessary

*Anticipate objections

*Enthusiasm is all-important

*Follow up

*Even failures provide information

*Practice...practice...practice

Gene Gregory

Campus Address
101 Morril Hall
University of Puget Sound
Tacoma, Washington, 95840
(206) 602-6206

Permanent Address
25 The Byway
Provincetown, Maine
05840
(617) 206-6026

GOAL: **A SALES CAREER**

EDUCATION: **UNIVERSITY OF PUGET SOUND** Bachelor of Arts 1989
Philosophy Major

Business-Related Courses
Statistics
Economics
Accounting
Introduction to Computers
Calculus
English

EMPLOYMENT: **UNIVERSITY OF PUGET SOUND**(Work-Study Program)

Dining Hall Supervisor	1988-89
Kitchen Helper	1985-87

OTHER WORK while in college

Ma and Pa Motel, Tacoma - night clerk	1988
Joe's Bar and Grill - weekend waiter & bartender	1987-89
Babysitting, gardening, house cleaning	1984-89

WATCHEE OUTEY SUMMER CAMP, Nome, Alaska

Sailing coach and waterfront director	1988
Counselor	1984-87

ACTIVITIES: **CAMPUS**
Chair, Campus Chest Drive
Intramural hockey, tennis, and volleyball

LIVING UNIT
House Manager, $25,000 budget
Secretary
Membership Committee

CIVIC
Reader-companion in nursing home
Big Brother-Sister Program, Southside Y

CHURCH
Choir
Youth leader
Sunday school teacher

INTERESTS: Fishing
Chess
Music
Dancing

SAMPLE RESUME
This Resume's Goal is to Demonstrate
Potential and Focused Interest

APPLICATION FOR EMPLOYMENT

(An Equal Opportunity Employer)

Personal Information

Date

Name
Last First Middle

Social Security Number

Present Address
Street City State Zip

Permanent Address
Street City State Zip

Phone

Are You 18 years or older? Yes ☐ No ☐

Do you have any physical condition which would require consideration in job assignment? Yes ☐ No ☐

Do you have legal authorization to work in the United States? Yes ☐ No ☐

Employment Desired

Position

Date you can start

Salary Desired

Are you employed now?

If so may we inquire of your present employer?

Have you ever applied to this company before?

Where?

When?

Education

Type of School	Name and Location of School		Dates Attended	Field of Study	Degrees or Certification
	From	To			
Grammar School					
High School					
College					
Trade, Business, or other formal education					

General

Subjects of Special Study or Research Work

Military Service Yes ☐ No ☐ If yes,what branch?

Dates of Duty: From: Month / Day / Year To: Month / Day / Year Rank At discharge

List duties in the service including special training

References: Give the name of three persons not related to you, whom you have known at least one year

Name	Address	Business	Years Acquainted
1.			
2.			
3.			

This company is an equal opportunity employer. Federal law prohibits discrimination on the basis of race, color, sex, age, religion, handicap, or national origin.

I certify that the above information is complete and correct to the best of my knowledge. In the event of employment, I understand that false or misleading information given in my application or interview(s) may result in discharge.

Date **Applicant's Signature**

Do Not Write Below this Line

Interviewed by: Date

Hired Yes ☐ No ☐ Position Dept.

Salary / Wage Date Reporting for Work

Technology Activity Module 16

PROBLEM SOLVING THRU

GRAPHIC DESIGN

by Mark Koca

Instructor Component

Activity Objectives:

This TAM is about problem solving. It is also about the necessary technical communication skills that make the problem solving process work. Stating a problem so others understand it, brainstorming alternative solutions, sketching potential solutions for others to see, refining a solution and ultimately creating precise technical drawings are all part of the challenge here.

Target Competencies:

1. Clearly identify and write a "statement of the problem" for a specified situation.
2. Utilize available resources to gain information related to a specified problem.
3. Apply formal processes for generating solution ideas to problems.
4. Sketch potential solutions for a specified problem.
5. Evaluate and refine solutions to a design problem.
6. Distinguish between thumbnail sketches, rough sketches, and comprehensive drawings.
7. Arrange production steps for technical drawing in their proper order.
8. Render accurate, reproducible technical drawings of design solutions.

TAM Instructions

Introduction:

This TAM is designed to provide students with a formal approach to problem solving while allowing them to develop their skills in sketching and technical drawing.

It can be set up as either an individual or group activity. If used as a group activity, care should be taken to ensure that all members of the design team understand their responsibilities in the design process.

In this activity students are presented with a design problem involving products or devices with which they are familiar with. Using brainstorming, sketching, and technical drawing ,each student or group will produce finished pictorial and orthographic drawings of their design solution. If appropriate, the best solutions may be taken to the prototype stage of the design process.

Safety Considerations:

Students should be reminded that their designs must include an adequate safety margin. All customer products must be reasonably safe when used properly and under normal conditions. This rule protects both the manufacturer and the consumer. If the design is taken to the prototype stage, the instructor should ensure that all students have received safety instruction relating to the tools and materials to be used.

Needed Materials:

Supplies

Drawing and tracing paper, B and C sizes

Equipment Machines/Tools

Standard drawing instruments and/or a CAD system

Handouts

a. A list of guidelines or specifications for the design problem. (The teacher creates the guidelines based on the design problem selected. See example design problems at the end of the instructor component of this TAM.)
b. Design Process Flow Chart
c. Activity Checklist
d. Rules for Brainstorming

Instructional Resources

a. An actual working model of the object to be modified (where appropriate).
b. Books/catalogs of specifications relating to the materials used.
c. References showing how different industrial processes work.

Management and Logistics

Related TAMS

None

Evaluation and Grading

Because evaluation of this activity is mostly subjective, it helps to break the evaluation into three areas:

- **Design** - simplicity, originality, feasibility, sequence of design steps, adherence to the original guidelines.

- **Drawing** - rendering, accuracy, appropriate views

- **Effort** - how much time was spent on the task. (Consider having the students keep a time log to submit with the design)

Suggested Schedule

This activity typically takes between 8 and 15 class hours, depending on the complexity of the problem. (HINT: Industry always works under deadlines, so set a feasible completion date and work toward it.) Allow 1-2 days for presentation/brainstorming, 4-5 days for sketching/evaluation/revisions, and 5-8 days for drawing.

Key Instructional Suggestions:

Safety

Emphasize the development of a safe design. The instructor will have to determine whether each design is potentially harmful.

Motivation

To increase student motivation:

- Run the activity as a contest
- Build the best design as a prototype
- Keep the basic problem simple
- Do not limit creativity
- Explore the possibilities for new materials and processes

Prerequisite Information

Students should have a working understanding of pictorial and multi-view drawing before beginning this activity.

Demonstrations

The instructor should demonstrate the following activities:

- Brainstorming (use an unrelated topic to demonstrate)
- Sketching (to reinforce previously learned skills)
- Function of finished product (where necessary)

Reinforcement

a. Remind students periodically of proper technical drawing procedures.
b. Give positive feedback regularly.

Attitudes

a. Emphasize that all products begin with a statement of the problem.
b. Encourage creativity in the brainstorming phase.
c. Encourage accuracy in the rendering of the drawings.
d. Use constructive criticism where appropriate.

Remediation/Enrichment

a. Team good students with poorer students; make sure that each student has an assigned task.
b. Break the problem down into its component parts for poorer students.
c. Allow advanced students to construct a prototype of their design.
d. Encourage advanced students to try non-traditional or unusual approaches to the problem.

Summary and Review

Remember that only half of this activity hinges on the finished product. The design process is the main thrust of this TAM. When reviewing, make sure the students know how they arrived at the solution, and stress the concepts that explain the design procedure.

Review Questions

1. What are the four major steps in the design process?
ANSWER: STATEMENT OF THE PROBLEM, RESEARCH, DEVELOPING IDEAS (BRAINSTORMING), AND EVALUATION.

2. What is the importance of sketches?
ANSWER: SKETCHES ARE USED TO HELP VISUALIZE IDEAS.

3. What questions should you ask yourself when evaluating a design solution?
ANSWER: DOES THE SOLUTION SOLVE THE PROBLEM? IS THE SOLUTION FEASIBLE? IS IT THE BEST SOLUTION?

4. What is brainstorming used for?
ANSWER: TO GENERATE IDEAS QUICKLY BY GROUP DISCUSSION AND INTERACTION.

5. How is the "statement of the problem" important to the design process?
ANSWER: IT ESTABLISHES A DIRECTION FOR THE DESIGN EFFORTS TO FOLLOW.

6. What is the first step in the design process?
ANSWER: IDENTIFYING THE PROBLEM.

Glossary

Brainstorming - a method used to develop ideas by verbal exchange between members of a group.

Design - the creative process for finding the solution to a problem.

Multi-view - a drawing that shows two or more views of an object.

Pictorial - a drawing that shows more than one side of an object, i.e., as it appears in a photograph.

Sketch - a drawing made without the use of special equipment.

Thumbnail sketch - a small sketch used to develop design ideas.

Pre-Assessment:

The instructor may wish to use these questions to evaluate student knowledge of the design process before beginning the activity.

1. What is design?
    - *The process of finding the best solution to a problem.*
2. What is the first step in the design process?
    - *Identifying the problem.*
3. What is brainstorming?
    - *A group activity used to generate and develop ideas.*
4. Why must detailed drawings be made of a product before it goes to manufacture?
    - *This is the method designers use to communicate with people who will actually implement the design. Drawings also allow many design problems to be worked out in advance.*

Post-Assessment:

Evaluation of this activity should be based on both the student's finished drawings of the design solution and on comprehension of the process used to arrive at the solution. The Activity Checklist will aid the instructor in determining how well the students are implementing the design process. The instructor may also wish to use the Review Questions on the Activity Checklist as a "pop" quiz midway through the activity.

Review Question Answers

1. Statement of the problem, research, developing ideas, and evaluation.
2. Sketches are used to visualize ideas.
3. Does the solution solve the problem? Is the solution feasible? Is it the best solution?
4. To generate ideas quickly by group discussion.
5. The statement of the problem establishes a direction for the design efforts to follow.
6. Identifying the problem.

DESIGN PROBLEM IDEAS

- Robot gripper to pick up a specified object
- Shipping container to protect a fragile object, such as an egg
- Modify a shop tool to perform a different function
- Modify a shop tool for a handicapped person
- Relocate buttons and controls on a clock radio
- Design a new tool for a specialized job
- Design a computer desk for a particular model of computer
- A better mousetrap?
- A personal/portable telephone
- A soda can crusher
- New slant on toothbrushes
- Better handle for a fishing rod
- Drink holder for car
- Device to allow small children to open doors
- Better-designed paintbrush
- Bicycle parking block for school
- New windshield wiper
- Desk reading lamp
- New kind of padlock
- VCR tape caddy
- New type of window blind
- A better automatic pencil
- Exercise equipment
- Multi-angle drafting triangle/scale
- Jig and fixture design
- A better ice scraper
- Doorknob-attached security system

Technology Activity Module 16

PROBLEM SOLVING THRU

GRAPHIC DESIGN

by Mark Koca

Student Component

Introduction:

In this activity you will learn how ideas for new products are developed into designs ready for testing as prototypes. You will use a step-by-step process to solve a design problem and then produce a finished set of drawings clearly illustrating your solution. You will develop several ideas and then evaluate each of them to determine the best solution. This process can be viewed as one requiring the utmost in communication skills.

Competencies:

You should be able to master these items during this activity:

1. Apply formal problem-solving processes to a design problem.
2. Evaluate and refine solutions to design problems.
3. Sketch solutions to design problems.
4. Make accurate, reproducible drawings of design solutions.

Module Overview:

All products start out as a design problem. Designers often use a step-by-step approach to solving their design problems. In this activity, you will work with one of these methods. This activity will also allow you to apply your drafting skills.

Your instructor will assign a design problem (together with a list of design specifications) and demonstrate to you the method to use when solving it. The instructor will also demonstrate brainstorming, which is a method of developing ideas for the design solution.

Motivational statement

Your goal is a set of pictorial and multi-view drawings that clearly illustrate how you solved the design problem. To get there you will first generate several ideas and get them down on paper as a set of thumbnail sketches. (See the Activity Checklist for further directions.) After evaluating the ideas you will make a refined sketch of two or three of your best ideas. Keep in mind that there are more materials available than just wood or metal. At this point it is time to commit yourself to just one solution. (However, keep all of your work sometimes your best plan fails and you will have to select an alternate plan.) The final part of this process is to make pictorial and multi-view drawings of your design solution. Measure carefully and remember to include all necessary dimensions on your drawings.

Relationship to Context

Remember that the problem-solving process learned here is a technical procedure that can be applied to many technical activities. In a communication class it can be used as a challenging activity in a variety of ways. Use it when confronted with a technical problem.

Key Instructional Suggestions:

Class Presentations

The instructor will help you do each of the following:
a. Identify and state a problem.
b. Find information about the problem.
c. Generate solutions to the problem.

Demonstrations

The teacher will demonstrate how to:
a. Sketch potential solutions to the problem.
b. Arrange the production step for technical drawings.
c. Render accurate, reproducible technical drawings of design solutions.

Safety

Please keep in mind that all design solutions must contain an adequate safety margin. Your teacher will be discussing this with you.

Personal Activity

The activities in this TAM assume that you have a working understanding of pictorial and multi-view drawing before you get started.

Needed Materials:

Supplies

The materials that you need for this activity are:
a. An "open mind"
b. Drafting paper

Equipment/Machines/Tools

a. Standard drafting instruments
b. CAD equipment (if available)

Handouts/Instructional Resources

a. Catalogs of materials/products
b. Activity Checklist (end of TAM)
c. Design Process Flow Chart (end of TAM)
d. Rules for Brainstorming (end of TAM)

Activity Sequence:

Instructor start-up & specific instructions

The instructor will clarify what is meant by a "problem". Discuss the application of problem solving in everyday life. Consider the cyclical yet flexible nature in the sequence of steps in problem solving and the importance of creativity in the process.

Pre-Assessment:

None

Plan of Procedure

Key Instructional Suggestions:

Use the following steps of procedure to arrive at a solution to your design problem:

Problem Solving in Technology (The Technological Method)

1. Identify the **problem**
    a. Analyze the problem
    b. Analyze the problem's context
    c. Define and clarify the problem

2. Establishing solution **criteria**
    a. Identify appropriate criteria
    b. Identify strengths and limitations
    c. Weight criteria according to the nature of the problem
    d. Develop a "design brief"

3. Assemble relevant **information**
    a. Search for information
    b. Analyze information
    c. Synthesize appropriate information

4. Formulate alternative **solutions**
    a. Identify and remove barriers to creativity
    b. Brainstorm

5. **Evaluate** alternative solutions
    a. Apply solution criteria
    b. Select optimum solution

6. **Implement** prototype solution
    a. Develop prototype solution
        (1) Produce drawing
        (2) Theoretical testing
    b. Plan implementation of soluti

7. **Refine** solution
    a. Communicate the solution
    b. Refine the prototype solution
    c. Implement the refined solution
    d. Monitor the solution on an appropriate basis

Review Questions

1. What are the four main steps in the design process?

2. What is the importance of sketching?

3. What should you ask yourself when evaluating a design solution?

4. What is brainstorming used for?

5. How is the "statement of the problem" important to the design process?

6. What is the first step in the design process?

Post-Assessment:

Your teacher will evaluate you based on your performance in these areas:

- **Design** - simplicity, originality, feasibility, sequence of design, and adherence to the original guidelines.
- **Drawing** - rendering, accuracy, and appropriateness.
- **Effort** - time on task.

Summary and Wrap-up

We live in a society filled with technical products and systems. All are the results of people first conceiving them as problems needing to be solved. Problem solving through graphic design is a set of techniques that allow designers, artists, engineers and others to work together and communicate their ideas for the purpose of creating or improving these products and systems.

Appendix

Rules for Brainstorming

Here are some points to remember when brainstorming to make the process more effective:

1. Allow everyone to have input.
2. Assign people to record as many of the ideas as possible.
3. Never criticize. (Sometimes the best solutions spring from what seem to be ridiculous ideas.)
4. Say whatever comes to mind. Don't lock yourself into one type of solution.

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Activity Checklist

________ **Received** design problem and instructions on how to proceed

________ **Write** the "statement of the problem" here: ____________________
____
____
____.

________ **Research**: Check into the types of materials that are available, how strong they are, what sizes they come in. Use catalogs, magazines, books, etc.

________ **Brainstorming**: Share your ideas with your classmates/group in a group discussion. You may be able to develop or combine ideas for the best solution.

________ **Thumbnail sketches**: Make small, quickly drawn sketches of the ideas you develop during brainstorming.

________ **Rough Sketches:** Pick two or three of your best thumbnail sketches and develop them into larger, more detailed sketches.

________ **Evaluation**: Select your best solution. Ask yourself these questions:

1. Does the solution solve the problem?
2. Is the solution feasible?
3. Is the solution the best solution? (If the answer is yes to all three questions, proceed to final drawing.)

________ **Final drawing**: Make drawings (as your instructor assigns) of your design solution. Be neat and accurate; include all necessary dimensions on your drawings.

Technology Activity Module 17

ANIMATION

by Jim Kyd

Instructor Component

Activity Objectives:

The purpose of this TAM is to familiarize students with the fun and importance of animation. Animation is used all around us in education, advertising, art and in entertainment as a very special medium to effectively communicate messages. And yet only a few people understand the history, terminology and resources associated with the animation process. This TAM deals with these processes; it also takes a look at some of the technology and safety involved in making an animated film.

Target Competencies

As a result of this TAM students will be able to:
1. Define animation.
2. Explain and demonstrate persistence of vision.
3. Identify potential safety hazards associated with animation.
4. Produce a short animated film.
5. Identify three possible career options involving animation.

Safety Considerations:

a. Always wear your safety glasses when in the lab.
b. Floodlights are electrical and hot; follow all safety procedures for using electric apparatus and be careful to avoid a burn.
c. Most paints are non-toxic. However, always read manufacture's instructions and take the necessary precautions.
d. There is a remote chance a film cut or paper cut could occur. Be careful.

Needed materials:
for the student

Activity #1
*Heavy matte board or 1/8" masonite.
*Cotton string
*1/4" dowel
*Scissors or coping saw
*Pens, pencils, paints, markers
*Layout tools
*Drill press

Activity #2
*Clear acetate or heavy white cardstock
*Pens or markers
*Studio setup
*Two-hole punch (for register holes)

Activity #3
*Heavy white cardstock
*Clear tape
*Studio set-up (See handout)
*Scissors or razor knife
*Pens, pencils, markers, paints

Needed Materials:
for the instructor

a. Clear acetate for cels (Overhead transparencies work fine but are expensive.)
b. Heavy white cardstock (matte board works well)
c. Cotton string (nylon is too slick.)
d. 1/4" dowels (could be larger in diameter)
e. Art supplies, pens, pencils, paints, markers
f. Tape (often needed to hold parts of cut-outs)
g. 8 mm films (Ektachrome 160)
h. Money to develop film

Tools

a. Camera - Use a Super 8mm with zoom and sound. It must have single-frame capability.
b. Tripod - Should be sturdy or can build a rostrum (See Handout #7)
c. Light stand(s) - You need two lights to expose film correctly.
d. 2 Light bulbs - 250 watt, 3200 degrees Kelvin are best, but 150 watt clear light bulbs may work well for animation work.
e. Light meter - The best type read in frames per second. (Many cameras have a built-in meter.)

Handouts

1. Thaumotrope Template and Hour to Build the Thaumotrope
2. Another Exercise in Persistence of Vision
3. Phenakisticope or Stroboscope
4. Thaumotrope Checklist
5. Kirchers Magic Lantern
6. Studio Layout
7. Studio Equipment
8. Stringtoon Sample
9. The Cel Method
10. Stringtoon Storyboard with Frame Steps
11. Cut-out Sample
12. Critique Sheet

Problem-solving methodology (Refer to TAM #16: Problem Solving Through Graphic Design

Instructional Resources

Books:

Anderson, Yvonne. Teaching Film Animation to Children. (Van Nostrand Reinhold, Library of Congress # 72-126985.)

Kinsey, Anthony. How to Make Animated Movies. (Viking Press, Library of Congress # 77-109216, ISBN 67038391.)

Cleave, Alan. Cartoon Animation for Everyone, (Argus Books LTD., ISBN 0 85242 556 x.)

Adamson, Joe. Tex Avery: King of Cartoons, Film Fan Monthly, 77 Grayson Place, Teaneck, N.J. 07666.

Master, Dave. Animation Video, Rowland Animation, 2000 S. Otterbin, Rowland Heights, California 91748. (Video is free if you send a self-addressed, stamped envelope and a blank video.)

Management/Logistics

Related TAMS

See TAM #16 : "Problem Solving Through Graphic Design."

Evaluation/Grading

Activity#1

- Pre- post-tests
- Checklist
  - Students - own
  - Other students
  - Teacher's
- Set out a percent for:
  - Effort
  - Ability to follow directions
  - Working with others

Activity#2

- Pre- post-tests
- Critique sheets:
  - Students - own
  - Other students
  - Yours
- Percentage for:
  - Effort
  - Creativity
  - Ability to follow directions
  - Working with others
  - Safety procedures
- Quality of storyboard
- How well did the movie follow the storyboard?

Activity #3

- Pre- post-tests
- Checklist:
  - Students - own
  - Other students
  - Teacher's
- Storyboard
- How well did the movie match storyboard?
- Percentage for :
  - Effort
  - Creativity
  - Ability to follow directions
  - Working with others
  - Safety procedures

Suggested Schedule/Time

Activity #1

Steps — Actions

1. Instructor introduction and motivation statement
    - Briefly explain what animation is and how you plan to work with it.
    - Show them studio set-up
    - Show the Dave Master Animation Video.
2. Pre-assessment/class grade so they get immediate answers
3. Lecture/demo
    - See instructor activity #1 lecture and handouts (in student component).
    - Show students the thaumotrope and how it operates.
    - Show Flicker book and or stroboscope.
4. Students do Activity #1
5. Post-assessment and checklists (Use Handout #4).
6. Wrap up

Activity #2

Steps — Action

1. Pre-assessment/class grade.
2. Show the students your stringtoon before going to step 2.
3. Lecture/demonstration on cel techniques: see instructor activity #2 lecture sheet (student component).
4. Lecture/demonstration on studio safety and equipment operation
5. Students do activity #2
   (At about this point show your finished).
6. Post assessment /critique sheet (Use Handout #12).
7. Wrap up

Activity #3

Steps — Action

1. Set up a contest allowing the top number of students to make a full length (3 minute) cartoon. Encourage students to go to district and the state exposition (you don't need to win districts to attend.).
2. Pre-assessment/grade in class.
3. Lecture/demonstration on cut out method See instructor activity #3 lecture sheet. (student component).
4. Students do Activity #3.
5. Post-assessment/critique sheets (Use Handout #12).
6. Wrap up.

Enrichment

- Have the best students make three minute, 8 mm films.
- Teach splicing and editing.
- Transfer the film images to videotape by using a local film processor at a camera shop.

Time

Having read the suggested schedule, make an estimate as to required time. Allow extra time in the development of storyboard stages so you can get the "creative juices" flowing without the anxiety of time deadlines.

Key Instructor Suggestions

Safety

See safety considerations above.

Motivation

A demonstration of the activities and the final products should provide sufficient motivation for students to do the activities.

Prerequisite Information

None.

Demonstrations

Activity #1
Demonstrate how a Thaumotrope, Flickerbook & Stroboscope work.

Activity #2
How to develop a cel storyboard
How to produce cels
How studio equipment works
How to produce a stringtoon

Activity #3
How to develop a cut-out storyboard
How to produce a cut-out cartoon

Attitudes

Show some previously made films, then brainstorm what they could do.

Remediation

- •Have peer tutoring and make a team film
- •Use the magic lantern or slide projector approach to making their film
- •Write Walt Disney or George Lucas for props or information.

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Enrichment

- •Have them produce a three-minute cartoon of a favorite song.
- •Let a team produce an epic—9-12 minutes—and let them learn editing.
- •Add music to these films! Obtain and examine a camera that will allow you to add audio to your film.

Summary and Review

Review the animation process and and interject information about career options in the animation industry.

Review Questions

1. What was Kirchers contribution to animation?
   (The magic lantern that started the technology.)

2. Why does the thaumotrope cause both images to look like one?
   (Persistence of vision)

3. What is a cel in animation and how is it used?
   (It is a clear plastic overlay that allows many action steps to be laid onto the background and photographed; it's one of the two basic methods of cartoon production.)

4. What is a cut-out and how is it used in animation?
   (It is a clear plastic overlay that allows many action steps to be laid onto the background and photographed. It's one of the two basic methods of cartoon production.)

5. Name two major safety hazards to be aware of in the studio.
   (Electrical shock and burns)

7. Why is animation used on TV?
   (Because it is a very effective communication medium)

8. How could you combine the old cel or cutout method with a computer?
   (Use computer-aided graphics and animation software with a color printer.)

10. Where is animation most effective in industry?
    (Children's shows, advertisements, and special effects)

11. Name three career options in the animation field
    (Computer animator, camera operator, editor, lighting technician, sales representative, script writer, etc.)

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Glossary

Animation - The technique of creating the illusion of movement in a film by shooting one frame at a time and making progressive changes to the subject between exposures.

Artwork - The various drawings, cut-outs, backgrounds, etc., used in the making of a cartoon film.

Background - A drawing or painting representing a setting in a cartoon film before which the characters are animated.

Baseboard - The flat working surface, normally at the bottom of an animation rostrum, which supports the artwork when it is being photographed.

Cel - A rectangular sheet of acetate, often 10 x 8 in., on which the animated portions of a character or object to be animated.

Cut-out - A piece of artwork prepared on thin card which represents some portion of a character or object to be animated.

Double-framing - The technique of exposing two frames on each drawing or cut-out arrangement, thereby halving the number of phases needed to represent a given movement.

Field - The area of view covered by the camera lens at a given zoom setting or distance from the baseboard.

Foreground - A piece of artwork representing an element of the scene that has the appearance of being in front of the main action and relatively near the camera.

Frame - One of the individual pictures which go to make up a shot in a film. Projection speed is expressed as so many frames per second. (f.p.s.)

Hold - The exposure of a series of frames on the same animation phase so that the action is "frozen" or "held"in a given position.

Judder - A jerkiness in the action seen on the screen--most noticeable in lateral movements --caused by too great a separation between the individual animation phases.

Key position - One of the defining phases of a movement, normally at the beginning and end.

Layout - (a)The general design of a scene, showing how the main elements are arranged within the picture area. (b) The way the animated elements of a scene are divided between the various layers of cels.

Panorama - An extended background which is moved by degrees across the rostrum baseboard to create the effect of a panning or laterally tracking camera.

Phase - One of the individual progressive stages of an action needed to create the illusion of movement.

Register pegs (or pins) - Two tall studs projecting from the surface of the rostrum baseboard (or a drawing board) which engage corresponding holes in animation paper, cels and backgrounds so that these are held in correct register with each other for filming (or drawing and tracing)

Rostrum - A construction of metal or wood designed to hold the camera, lights and artwork in the correct relationship; used when filming an animated cartoon.

Setting - The "scenery" for a shot in a cartoon film. It may consist only of a simple background behind the action or may be split between various layers of artwork.

Shot - The basic unit of film construction; in live production, the term is used to describe the action covered by one particular camera set-up. In a cartoon, it means a series of frames exposed on one setting and its associated action.

Sound track - (a) That area of the film which carries the sound signal. It can be in the form of a photographic image (optical track) or applied magnetic recording material (magnetic track). (b) The sound content of a film generally.

Squash - The animator's term for the way an object is distorted to represent the exaggerated effects of impact and momentum.

Storyboard - A detailed pictorial treatment of the way the action is to be developed and depicted in a film.

Substitution - The act of replacing one cut-out by another to achieve an animation effect that requires the use of a cut-out with a different profile or marking.

Swish - An arrangement of speed lines to suggest the blur associated with very rapid movement. Used with discrimination, it can be an effective economy device.

Template. A guide shape, sometimes with marked divisions along its working edge, to aid the positioning of cut-outs on the background.

Pre-Assessment Key:

(For student component)

Activity #1

1. Animation has two basic elements: The telling of a story through a series of pictures and the reproduction of movement within those pictures.

2. Persistence of vision is the way an image "burns" itself onto our retina and remains with us for a fraction of a second after the image has been removed. This is the basis of animated films.

3. Persistence of vision applies during the showing of a succession of images when your eyes link together images into a continuous and natural sequence of movement.

4. Animation is a novel and flexible communication process that can be appealing to people of all ages.

Activity #2

1. Most of us consciously retain the overall impression of a scene. We call this memory "imaging". Memory imaging, coupled with how we have "learned" to see over the years, helps to fill in all the gaps the animator leaves in the interest of speed.

2. Today, cinema film is a long strip of transparent acetate sheeting upon which there is a series of small pictures. Each picture is a frozen movement of a succession of movements that are all hooked together by the acetate. If you run this film through a projector at a specific speed, you see the illusion of continuous action on the screen .

3. Film runs through the Super 8 mm camera at 18 frames (pictures) per second.

4. Shock or burn.

5. The cel method and the cut-out method.

Activity #3

1. Painted images you move and film to make animations.

2. What we remember things look like.

3. Person.

4. Artist, film technician, light and sound engineer, editor, advertising, graphic artist, others.

Post-Assessment Key:

Activity #1

1. Animation has two basic elements: The telling of a story through a series of pictures and the reproduction of movement within those pictures.

2. Persistence of vision is the way an image "burns" itself onto our retina. It remains with us for a fraction of a second after the image has been removed. This is the basis of animated films.

3. Two images that you want to "combine" are drawn--the first on the front side, the second on the back side of a disc. Using the procedure on Handout #1, the disc is spun. Persistence of vision provides the illusion that the two images are combined on the same surface.

4. Animation is a novel and flexible communication process that can be appealing to people of all ages. Recently, the use of the computer has made the process more efficient and economical.

Activity #2

1. 18 per second

2. Shock and burn

3. Cel

4. To keep each cel correctly lined up with all the other cels when drawing and shooting

5. Today, cinema film is a long strip of transparent acetate sheeting upon which there is a series of small pictures. Each picture is a frozen movement of a succession of movements that are all hooked together by the acetate. If you run this film through a projector at a specific speed, you see on the screen the illusion of continuous action.

6. To layout the entire stringtoon, then to draw each cel

Activity #3

1. Painted images you move and film to make animations.

2. What we remember things look like.

3. Person.

4. Artist, film technician, light and sound engineer, editor, advertising, graphic artist, others.

Technology Activity Module 17

ANIMATION

by Jim Kyd

Technology Activity Module 17

Student Component

Introduction:

Film-making is an exciting vocational option in which you can have fun, enjoy a varied work schedule and make a lot of money. But before you can make an animated film, you must learn the the techniques of animation. After you know these skills, you will be limited only by your imagination.

Target Competencies:

As a result of this TAM students will be able to :

1. Define animation.
2. Explain and demonstrate persistence of vision.
3. Identify potential safety hazards associated with animation..
4. Produce a short animated film.
5. Identify three possible career options involving animation.

Motivational statement

The purpose of this TAM is to familiarize you with the fun and importance of animation. Animation is used all around us in education, advertising, art and entertainment as a very special medium to effectively communicate messages. And yet only a few people understand the history, terminology and resources associated with the animation process. This TAM deals with these processes; it also takes a look at some of the technology and safety involved in making an animated film.

Relationship to context

Animation is a technique that is used with many other communication systems, including film, television, radio transmission systems, and graphics.

Key Instructional Suggestions:

Demonstrations

a. Listen to the instructor's explanation of animation.
b. Watch the teacher's demonstration of the thaumotrope, stroboscope, flicker book, cel method, and cut-out method for making animated images.
c. Observe demonstrations of equipment operation.
d. Observe the demonstration of persistence of vision.

Safety

a. Always wear your safety glasses when in the lab.
b. Floodlights are electrical and hot; follow all safety procedures for using electric apparatus and be careful to avoid burns.
c. Most paints are non-toxic, but always read manufacturer's instructions and take the necessary precautions.
d. There is a remote chance a film cut or paper cut could occur. Be careful.

Personal Activity

Write a letter to Walt Disney Studios, Lucas Films, or MGM to inquire about how animation on computer is done.

Pre-Assessment:

Activity #1: The Beginning of Animation
Try to answer each of the following questions:

1. What are the two basic elements of animation?
2. What is persistence of vision?
3. How is persistence of vision used in the animation process?
4. Why is animation popular with the American public?

Activity #1: Lecture/Demonstration
- Animation has two basic elements:
    1. The telling of a story through a series of pictures
    2. The reproduction of movement within those pictures

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- Animated film as we know it today is less than 100 years old.
- However, some cave paintings trying to show movement and tell a story are thousands of years old.

- One of the most significant developments to film came around 1640 when Athanasus Kircher developed the Magic lantern. (See Handout #5, Kicher's Magic Lantern). This was the predecessor of the modern slide projector.

- His later improvements had a revolving disc with a number of hand-painted images that told a story.

- Pieter Van Musschenbroek came later in the eighteenth century and added a second projector; while one was showing the background, the other was playing out the story.

- At that point, many devices were invented to entertain individuals.

- In the 1820s, an English doctor named John Parls invented the thaumotrope.

- A demonstration of the teacher's thaumotrope, flickerbook, and stroboscope.

- The reason you see both images together is due to persistence of vision, the way an image "burns" itself onto our retina and remains with us for a fraction of a second after the image has been removed. This is the basis of animated films. Persistence of vision enables us to show a succession of images that eyes link together into a continuous and natural sequence of movement.

Activity #1: Steps of Procedure
Building A Thaumotrope:

1. Cut out template (Handout #1) and tape to matteboard, cardboard, or 1/8" masonite. Thin materials don't spin well because they fold over when spinning and tear out at the string holes or don't have enough mass to spin well at a steady speed.

2. Cut out a 2" disc following the template on Handout #2.

3. Center punch and drill (4) 1/8" holes, being careful to wear safety glasses and use a backing block.

4. Cut two pieces of string 18" long.

5. Coat 1/2" of each end of the string; twist into a point and let dry. Be sure it is not on a surface to which it will stick!

6. Draw the two images you want to "combine"—the first on the front side and the second on the back side of the disc. Your picture will work best if you:
    - Carefully use center lines to align your images from side to side.
    - Keep your drawings simple.
    - Make clear, dark lines with ink.

7. With the drill press, drill two 1/8" holes in a 1/4" dowel as shown Figure #1 (Handout #1); cut two 1/4" dowels each 2" long and sand ends smooth.

8. Thread string through the disc and dowel holes as shown in Figure #2 (Handout #1) and then tie a square knot to secure.

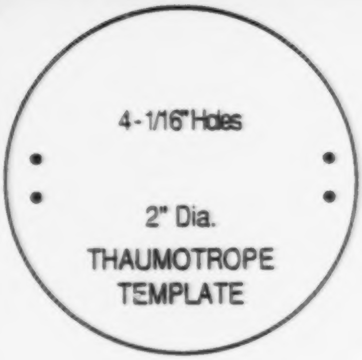
9. Holding the two dowels, spin the disc several times like a jump rope as shown in Handout #1 Continued.

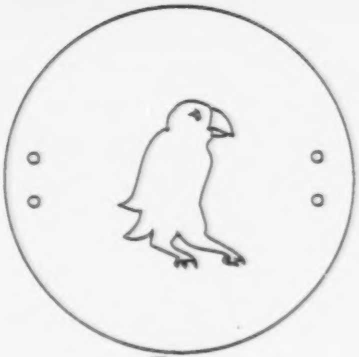
10. Now pull gently away from the disc with the dowels and watch the disc spin. With practice, you can keep the disc spinning back and forth indefinitely.

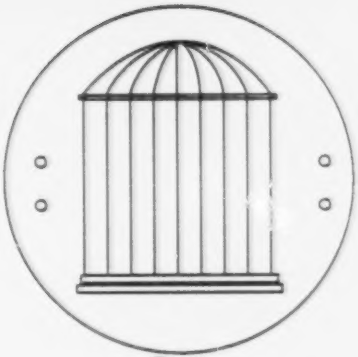
Now that you are a thaumotrope "pro", experiment with:
1. Different shaped discs.
2. Spinners with three, four or more faces with pictures.
3. See if you can create movement in any direction across the face.
4. Try the Flickerbook exercise shown on Handout #2.
5. Try creating a Phenakisticope as shown on Handout #3.

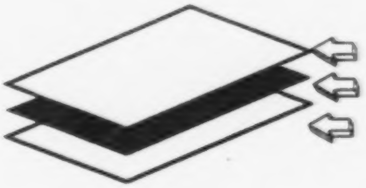
Handout #1

Thaumotrope Template and How to Build the Thaumotrope


4-1/16" Holes
2" Dia.
THAUMOTROPE TEMPLATE


Front


Back


TEMPLATE
CARBON PAPER
MAT BOARD OR MASONITE

LAY TEMPLATE ON CARBON OR MAT BOARD, TRACE THEN CUT OUT. BE SURE TO MARK THE 4-1/16" HOLES.

FIGURE #1

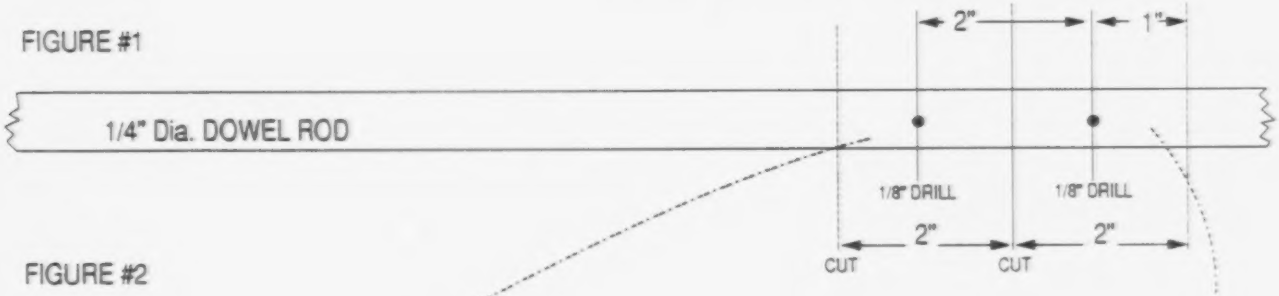
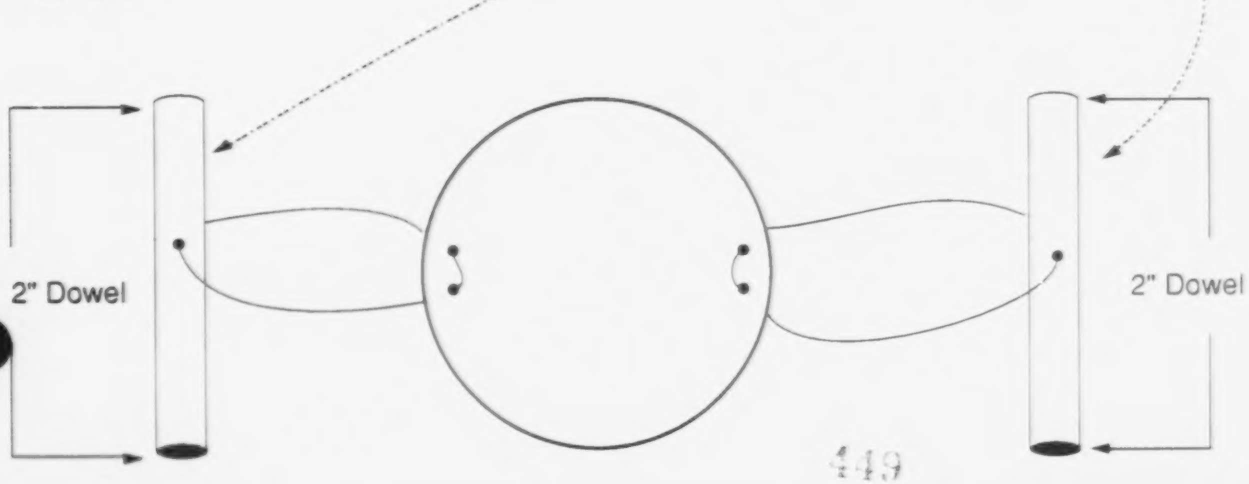
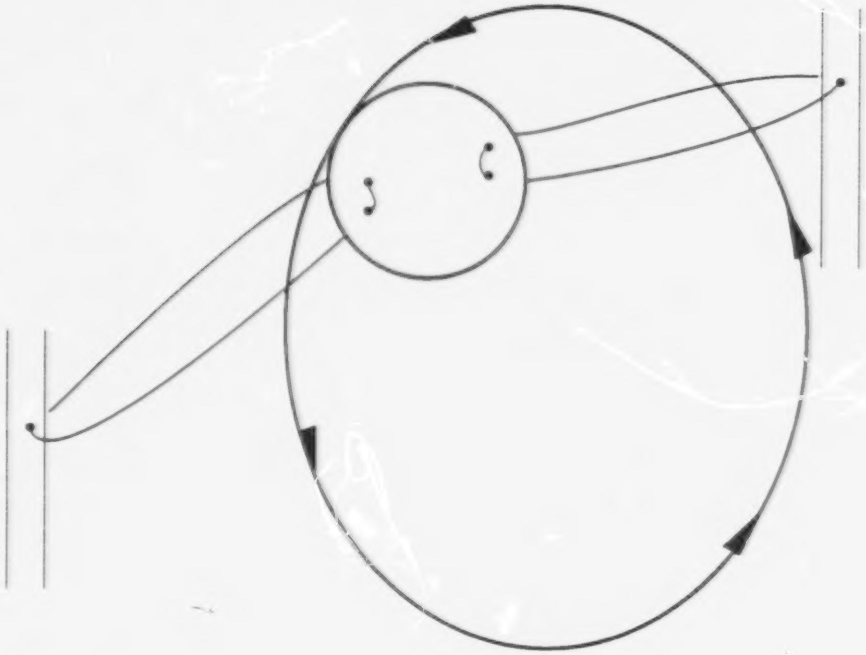
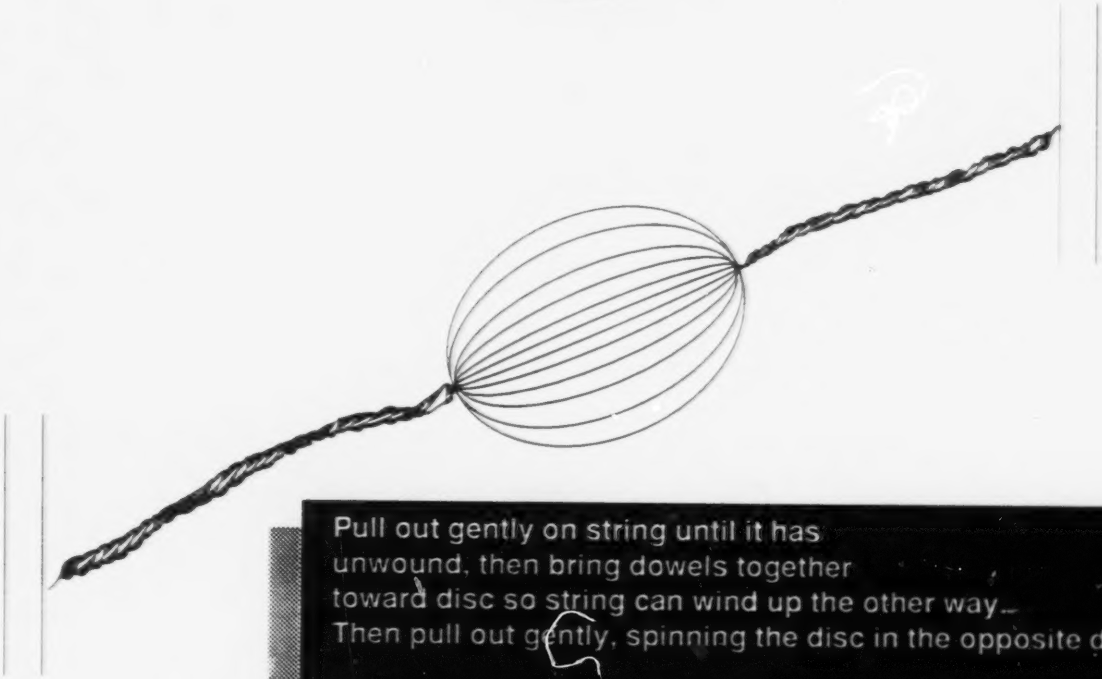

2"
1"
1/4" Dia. DOWEL ROD
1/8" DRILL
1/8" DRILL
2"
2"
CUT
CUT

FIGURE #2


2" Dowel
2" Dowel





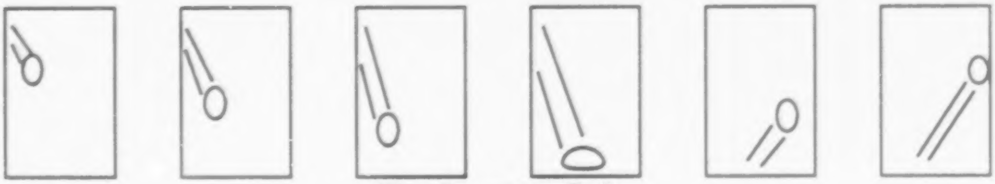
Pull out gently on string until it has
unwound, then bring dowels together
toward disc so string can wind up the other way.
Then pull out gently, spinning the disc in the opposite direction.

With a little practice, you'll be able to develop
a feel for it and will be able to maintain the spin indefinitely.

Flickerbook

Cut out stiff paper into 2" squares.

Draw your pictures in sequence, one per page.



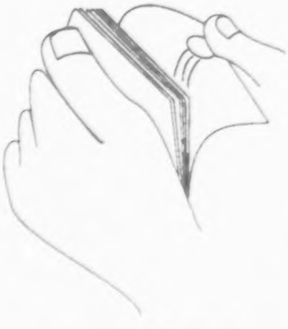
The Bouncing Ball

Sequence your drawings the way it is easiest
for you to flick the book - either front to back or back to front.

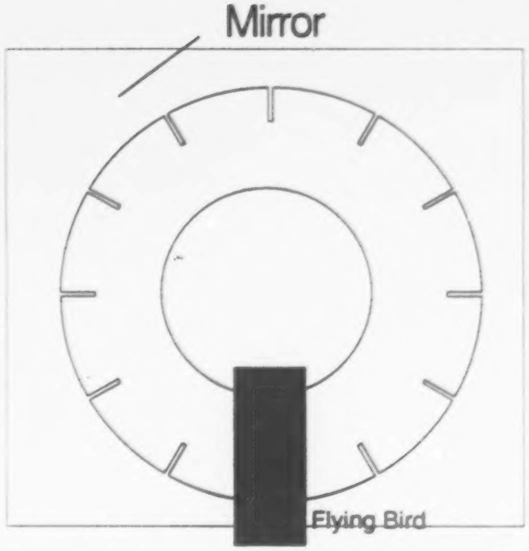
Bind the book using tape or staples.

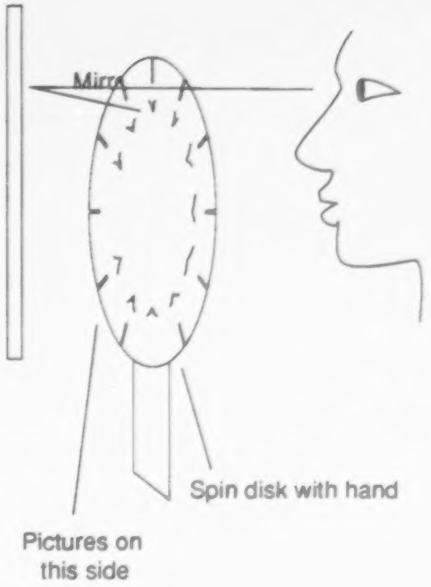
Hold completed book in one hand and flick with the other.

Try running stick figures, talking faces, speeding cars,
bouncing balls, bursting bubbles, opening flowers,
rising smoke, slam dunks, or exploding bombs.



Handout #3
Phenakistiscope or Stroboscope Figures 1-4

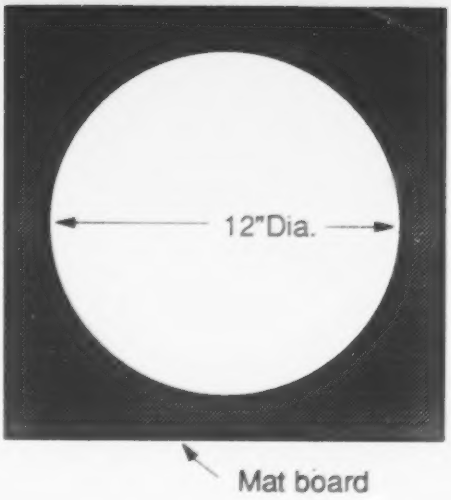




- Cut out 12" Circle from Mat Board.
- Draw 2 concentric circles on the disk.
  (1) 10 " in diameter (see Fig. #1).
  (1) 6" in diameter.
- Using a protractor, divide circle into 30 degree slices of a pie (see Fig. #2).
- Using a mat knife, cut 1/8" wide notches from the outer edge of the disk to the 10" diameter line. You should cut 12 notches (see Fig. #3).
- Erase all lines on the disk.
- Draw your picture sequence. One picture below each notch (see Fig. #4).

  *Remember: This is a continuous or circular sequence.
  To have a smooth animated movement, the sequence
  should be drawn so it flows like the birds in the example.
- Nail completed disk to a piece of wood with the pictures on the nail head side.
- Hold disk pictures away from you. Looking through the notches into a mirror, gently spin the stroboscope. The faster you spin, the faster bird flies, until you go so fast you can't focus on each picture and it becomes a blur.

Handout #3 continued
Phenakistiscope or Stroboscope Figures 1-4


12"Dia.
Mat board

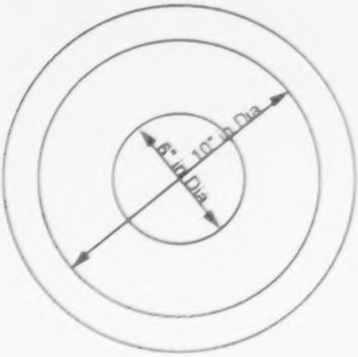

10" in Dia
6" in Dia

Fig. #1

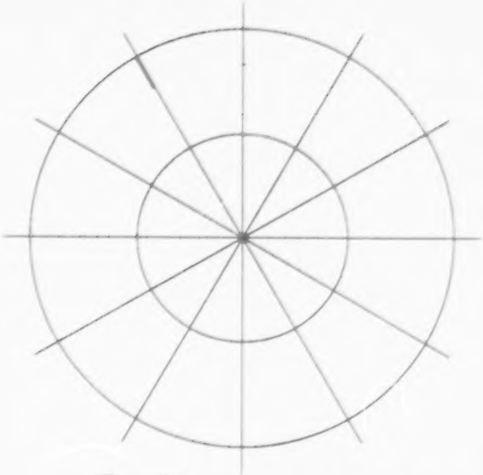


Fig. #2
- Draw lines in 30 degree increments from the center of the disk

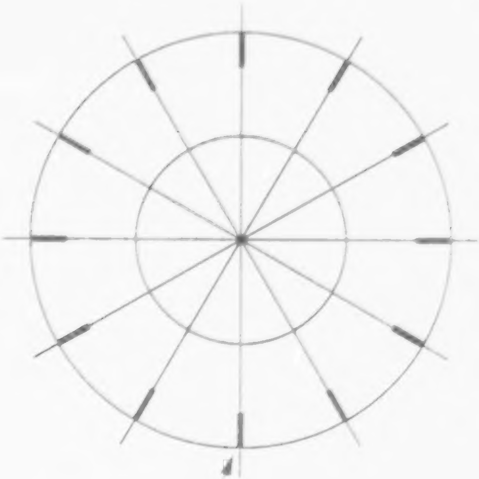


Fig. #3
- Remove 1/8" notches

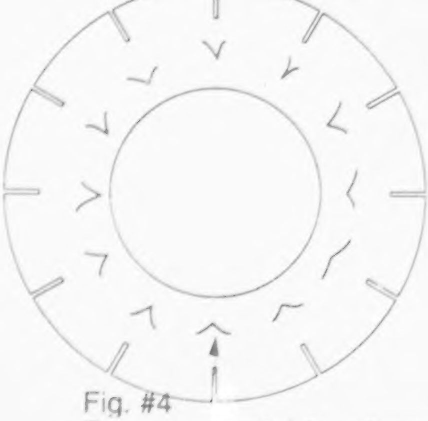


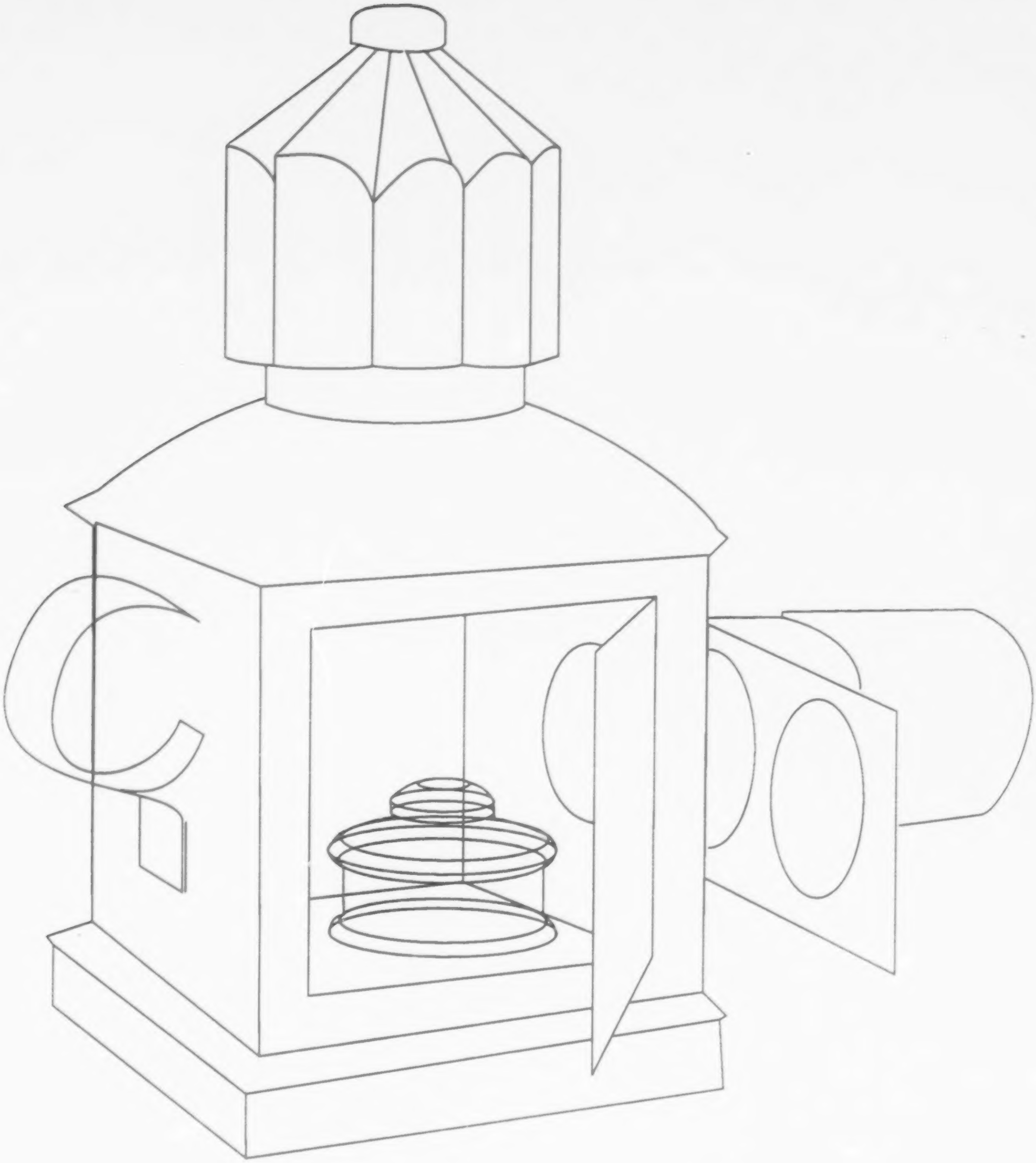
Fig. #4
- Draw sequential (continuous) images on the stroboscope disk. (This is a bird flying).

Handout #4
Thaumotrope Checklist

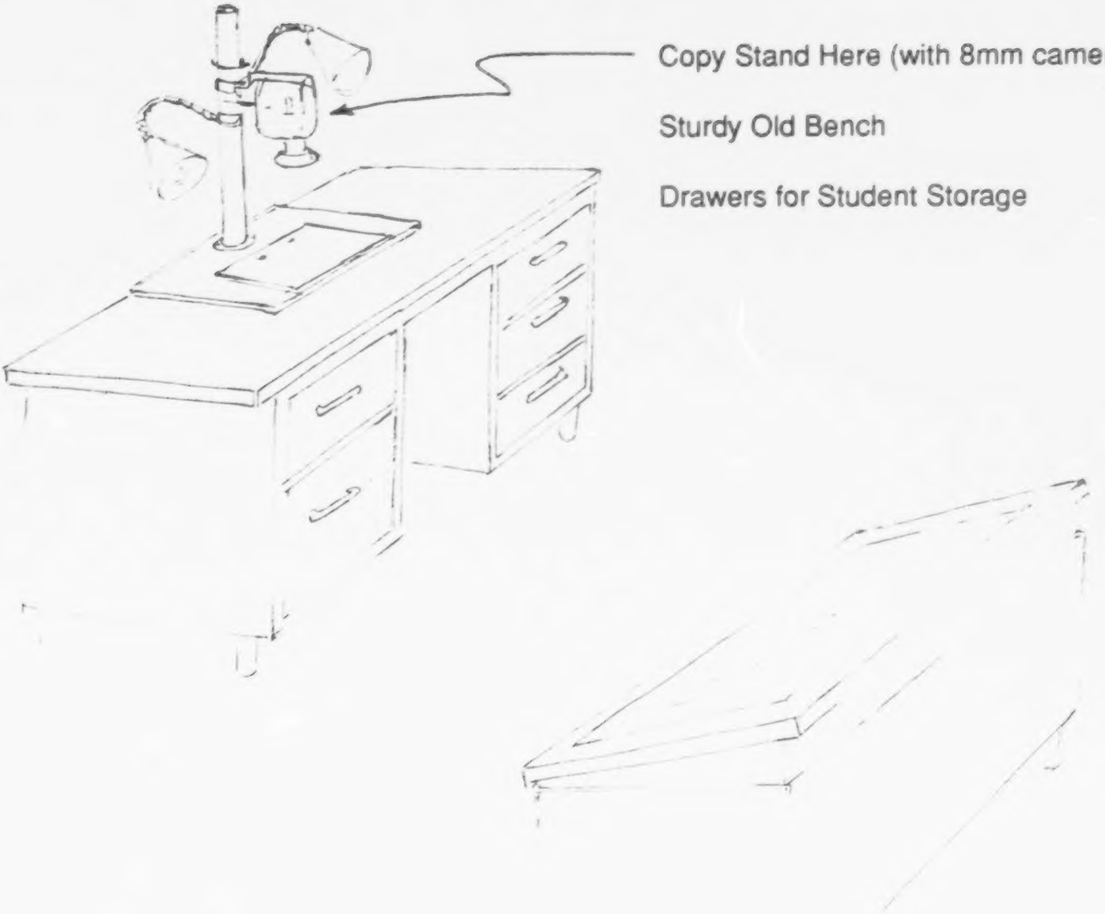
	Good	Average	Poor	
	1	2	3	
1. How closely is the disc cut to 2" in diameter?				
2. Does the disc have neat & cleanly cut edges?				
3. How accurately are the holes in the disc drilled?				
4. How accurately were the holes drilled in the center of the dowels?				
5. Were the string ends glued and pointed correctly?				
6. Was the Thaumotrope strung correctly?				
7. Are the pictures clear?				
8. Do the pictures align?				
9. Are the lines dark and clean?				
10. Are the pictures neat & clean?				

Add up the total and divide by 10 to get the overall rating.

Handout #5
Kircher's Magic Lantern



Handout #6
Studio Layout



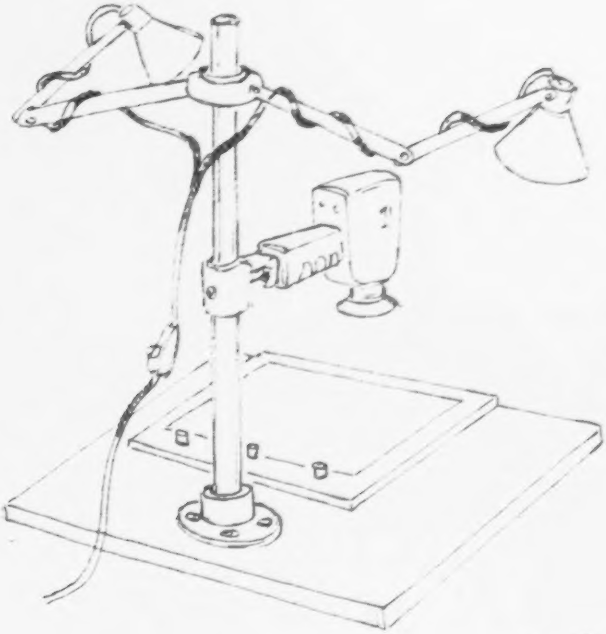
Copy Stand Here (with 8mm camera)

Sturdy Old Bench

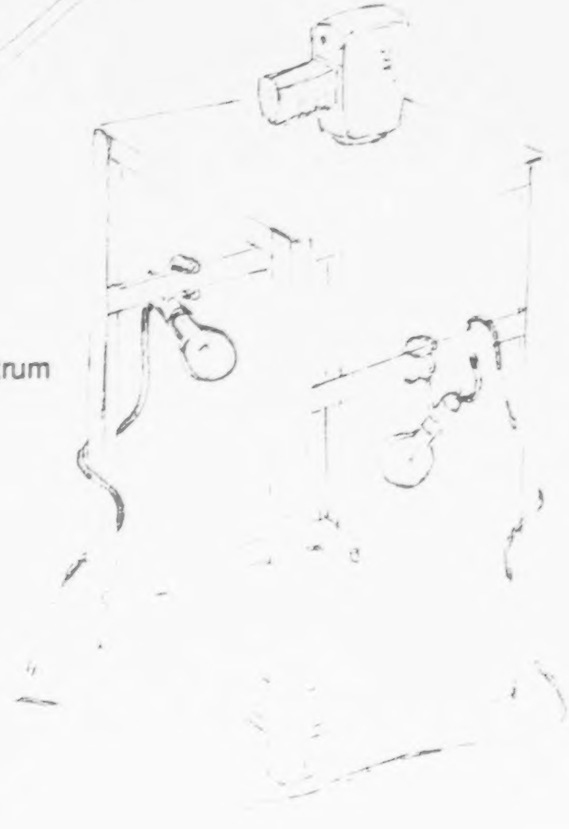
Drawers for Student Storage

A light table so that students can clearly see cels is great, but not necessary.

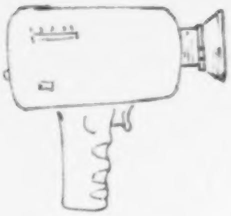
Handout #7
Studio Equipment



Copy stand

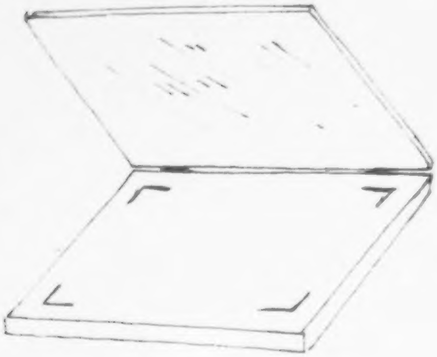


Rostrum



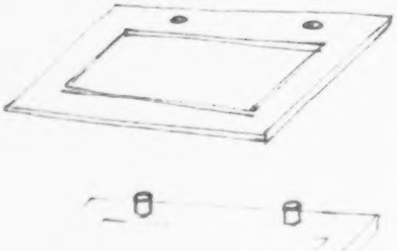
Camera

8 mm
Automatic/sound
Must be able to shoot one frame at a time



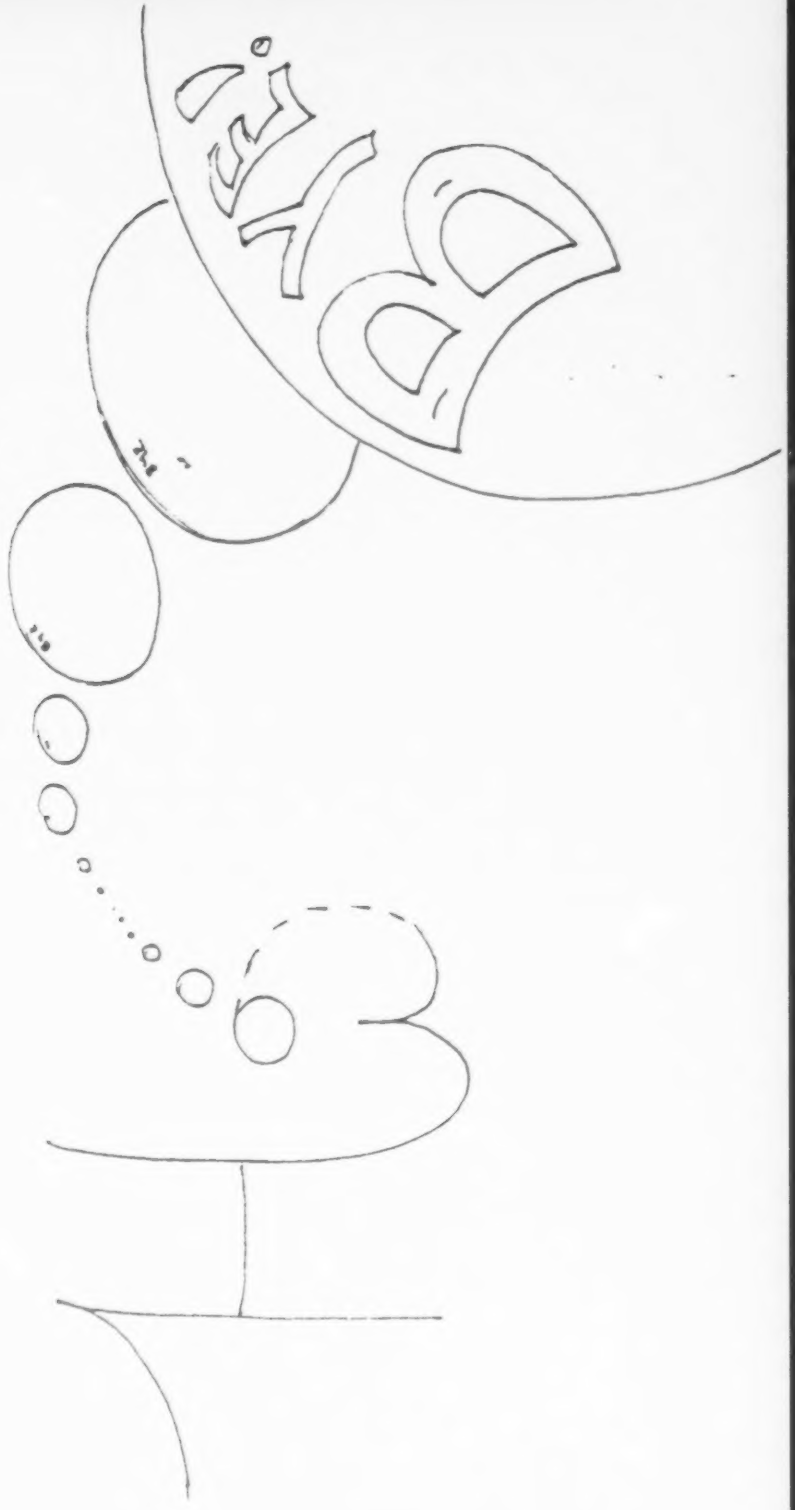
Registration Boards

Glass top/tape hinge
Four location corners
3/4" base

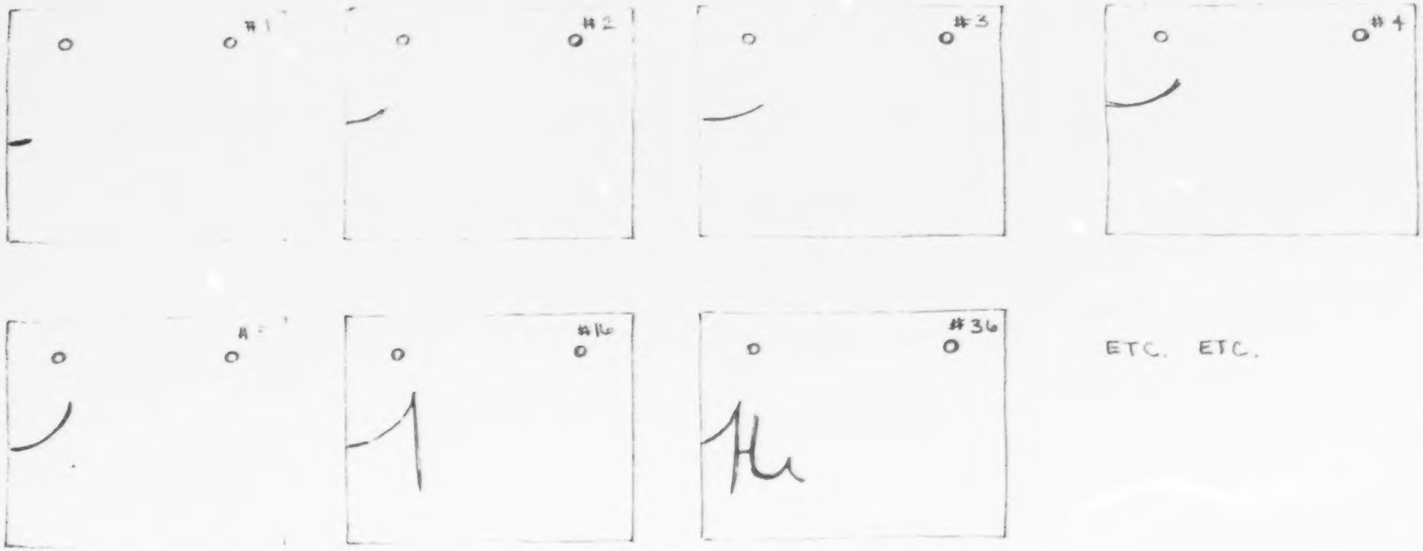


Mat board "frame"
3/4" base/registration pins

Handout #8
Stringtoon Sample

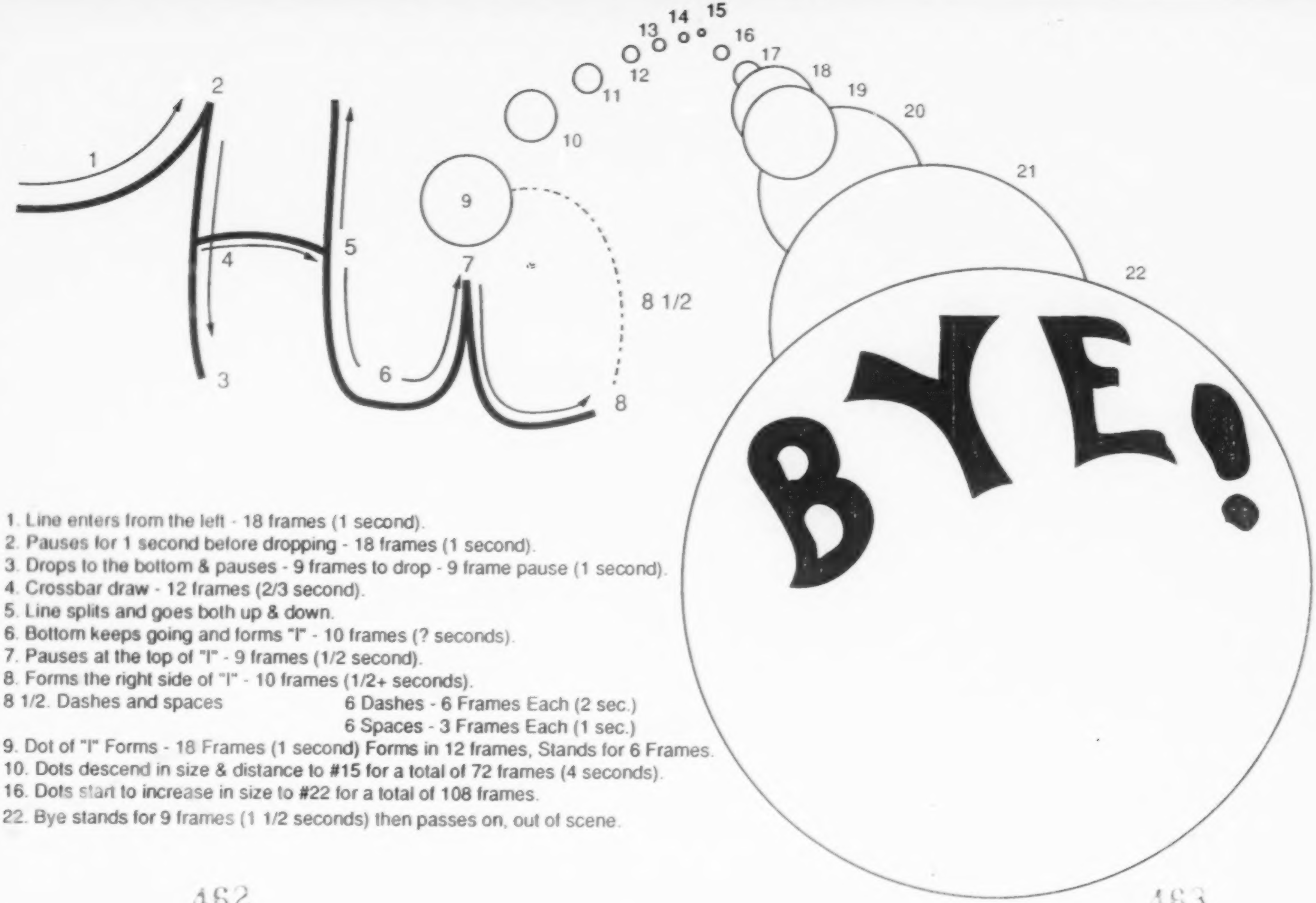


Handout #9
The Cel Method

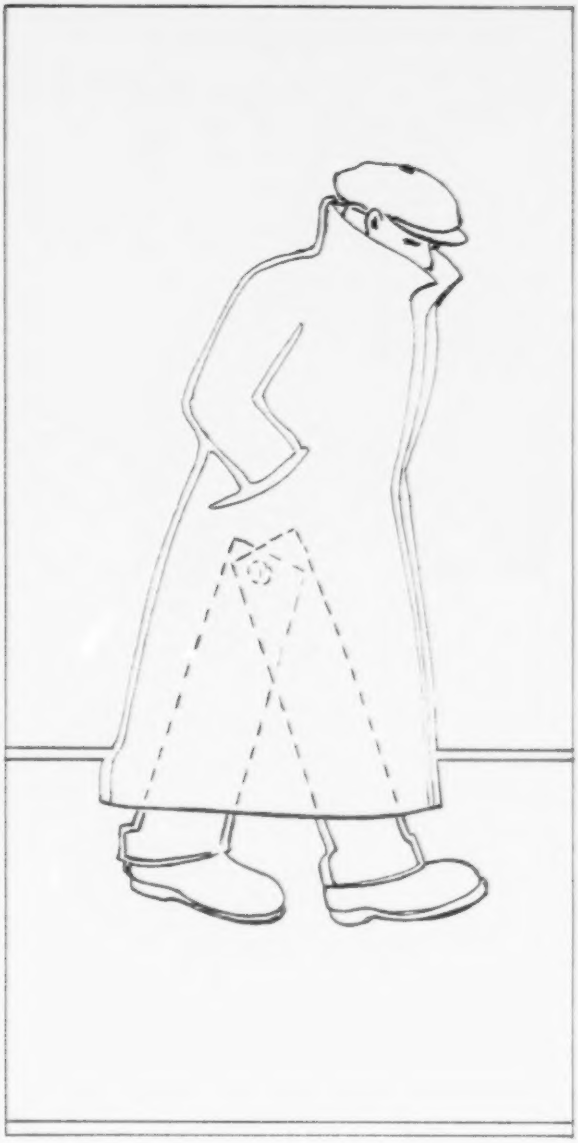


- •Cel #1 is placed on the Registration Board and two frames are shot of it.
- •Cel #1 is removed and Cel #2 is put in its place and two frames are shot of it.
- •This goes on for every Cel through the sequence.
- •To make a line move faster, shoot fewer frames per cel or draw longer lines per Cel.
- •To make it go slower, shoot more frames or shorten the line per cel.

Handout #10
Stringtoon Storyboard with Frame Steps



1. Line enters from the left - 18 frames (1 second).
2. Pauses for 1 second before dropping - 18 frames (1 second).
3. Drops to the bottom & pauses - 9 frames to drop - 9 frame pause (1 second).
4. Crossbar draw - 12 frames (2/3 second).
5. Line splits and goes both up & down.
6. Bottom keeps going and forms "I" - 10 frames (? seconds).
7. Pauses at the top of "I" - 9 frames (1/2 second).
8. Forms the right side of "I" - 10 frames (1/2+ seconds).
8 1/2. Dashes and spaces 6 Dashes - 6 Frames Each (2 sec.)
6 Spaces - 3 Frames Each (1 sec.)
9. Dot of "I" Forms - 18 Frames (1 second) Forms in 12 frames, Stands for 6 Frames.
10. Dots descend in size & distance to #15 for a total of 72 frames (4 seconds).
16. Dots start to increase in size to #22 for a total of 108 frames.
22. Bye stands for 9 frames (1 1/2 seconds) then passes on, out of scene.



Review Your Movie and Answer These Questions

- Does everything move at the correct speed?
- If not, what needs changing? (Be specific)
- Is your artwork clear and easily understandable?
- How was your registration?
- If you had to do it over, what would you do differently?
- Does anything seem jerky?
- After the class views your movie, see how your critique matches theirs.

Post-Assessment:

Activity #1:

1. What are the two elements of animation?
2. What is persistence of vision?
3. How does a Thaumotrope work visually?
4. Lately, animation is becoming very popular. Why?

Use Thaumotrope Checklist, Handout #4, to evaluate student work.

Pre-Assessment:

Activity #2: Cel Method Stringtoons

1. Can we understand what we see immediately or do we "learn" to see as children?

2. Explain what a cinema film consists of.

3. How many frames per second does a Super 8 mm camera run?

4. When using electrical photography and lighting equipment, you must be extremely careful not to ________or ________ yourself.

5. What are the two basic methods for making cartoons?

Activity #2: Lecture /Demonstration

History

•In the early 1900 Emile Cohl, a Frenchman, began to draw black line drawings in succession on white paper, take pictures of them and then project them on a screen. They looked like a white line moving on a black background.

•By 1915 American Earl Hurd patented the cel process. The cels were clear transparent sheets that were superimposed onto the background to develop a succession of pictures. (Use Handout #9 to show the technique.)

•Today, cinema film is a long strip of transparent acetate sheeting upon which there is a series of small pictures. Each picture is a frozen movement of a succession of movements that are all hooked together by the acetate. If you run this film through a projector at a specific speed, you see on the screen the illusion of continuous action.

Technical Facts

•Film runs through the Super 8 mm camera at 18 frames (pictures) per second. To take a one minute film, you would need 1,080 frames.

•Obviously, making each frame different takes a long time. Fortunately, there are ways to get around this problem.

•Most of us consciously retain the overall impression of a scene. We call this memory "imaging". Memory imaging coupled with how we have "learned" to see during preceding years of our lives helps to fill in all the gaps the animator cannot fill. It would take too much time.

•You will soon learn to think in terms of timing and frames. For example, one stride of a person takes approximately one second. Instead of shooting 18 different frames, you can achieve the same effect taking six three frame shots, which saves time. Some animators even shoot three different positions of six frames each.

•Even though this image is actually jerky, your memory images and learned sight (you know how walking "should look"), coupled with persistence of vision, smoothes the sequence into fluid walking.

Information on Cels

•You can save money and do your "stringtoons" without cels. However, by using them you will learn the technology used to correct the mistakes in major animated productions and drawings.

•You can also have several students follow you in series on one roll of film, which saves money. Run a four second (72 frame) lead cell in the beginning and a four-second credits cell at the end of each film, followed by four or five seconds of "laying black" before the next lead.

Creating Cels

•To create cels, you will need to set up a base board with register pins. (see Handout #9)

1. Find a hole punch that will punch the outside two holes.
2. Punch a piece of 8 1/2 x 11" matte board
3. Divide the matte board into quadrants with the intersection of the two lines being the center of the matte board.
4. Lay the matte board on base board; be very careful to keep both matte and baseboard sides parallel; look through camera and put it in the center of the view finder.
5. Mark where the register pins should go using the matte board as a template.
6. Next, find screws or cut the heads off of steel pins or use plastic rod. The material should be smooth and close to the register hole size. Imprecision here will show up later in the filming.
7. You're now ready to make your cels off of your storyboard (artwork to be traced onto acetate).
8. Your storyboard should be the complete story and should have register holes.
9. Lay it on the baseboard. Put a cel on top of it and make your first line. From the start to the first line is called a "tic" on your storyboard. Examine Handout #10, Stringtoon Storyboard With Frame Steps.
10. Take off Cel #1 and lay on Cel #2. Draw what was on Cel #1 and add a new line until you get to the Cel #2 tic on the storyboard. Remember, the longer the new line is, the faster the line will appear to move in the film. Remember, too, that it takes 18 frames to make one second of film image. If you move 1/4" per cell and shoot two frames per cell, the line will move 18 frames / sec. (divided by two frames per cell, equals nine cels per second). So nine times 4 "of line travel per cel equals 2 1/4" per second of line movement.
    (See Handout #9)

11. When you are finished, don't forget to make a title (or lead) cel and a credit (or end) cell. Film each in sequence for at least five seconds so people can focus and read them.

Caution: Remember to **number all cels as you make them**!!!

Activity #2: Steps of Procedure

1. Look at Handout #10 for an example of a stringtoon storyboard. It is very important that you plan out your stringtoon so you don't make mistakes.

2. Develop your own storyboard. Be sure to figure the sequence of shots and the total time to make them.

3. Since you are using the cel method, you will need to get the cels (overhead transparency film works well) and punch register holes with the paper punch. If you don't have transparent cels, you can use white card stock paper. (Check with your teacher first).

4. Carefully number and draw each cell.

5. Draw the logo lead-in cel and the credits or ending cell.

6. Have your teacher check your work.

7. Shoot your film. (See Handouts #6 and #7 for studio equipment setup).

8. After the film has been processed, review your movie and answer the questions on the Critique Sheet, Handout #12.

After the class views your movie, see how your critique matches theirs.

Post-Assessment:

Activity #2

1. How many frames per second does your camera shoot?

2. When using flood lights, be careful not to ________ or _______ yourself.

3. What basic method did you use for making your stringtoon?

4. What are register pins used for?

5. What does a cinema film consist of?

6. How is a storyboard used?

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Pre-Assessment:

Activity #3
The Cutout Method: Moving People

1. What are cutouts?

2. What is a memory image?

3. When critiquing a film, it is important that you critique the product, not the_______.

4. What career options does animation offer you?

Activity #3: Lecture/Demonstration

•Now that you have a short production completed, this next activity will be an easy step.

•Pick a character and draw it with colors.

•Figure out what actions they will do. Examples might be: lift a barbell, walk away, talk, sing, cry, faint, do a handstand, or disappear.

Activity #3: Steps of Procedure

Steps:

1. Study the handout on cut-outs (Handout # 11).
2. Pick the character and action you want to reproduce and draw a storyboard. Caution: Keep this simple so you can learn the basics without being bogged down with an epic (long) production.
3. Draw your character for shooting.
4. Make a dry run of your movie to be sure the timing and moving parts all fit properly.
5. Expose the 8mm film. (Handouts #6 and #7).
6. When you get the film back from the processor, review it and answer these questions. (Handout #12).

•Does everything move at the correct speed?

•If not, what needs changing? (be specific.)

•Is the art work clear and easily understandable?

•How was the registration?

•If you had it to do over, what would you do?

•Does anything seem jerky?

After the class views your movie, see how your critique matches theirs.

Post-Assessment:

Activity #3

1. Explain the difference between the cel and the cut-out methods.

2. How does an animator use memory images?

3. Who is your favorite famous animator? Why?

4. When critiquing a film, it is important that you critique the film and not the_____________.

5. Name three career options in the field of animation.

6. Name two safety hazards to watch out for in your animation studio.

Summary and Wrap-up

Animation is used for entertainment, education, advertising, and as an art form. The technology of animation helps us see reality through the eyes of the artist in a unique and very special way. In this TAM, you learned the principles of animation, especially the idea of persistence of vision and techniques for creating the impression of moving images. Acetate, cut-outs, an 8mm projector and film were used to record the animated images, but in the future, computer-generated images will be the most common.

Section III: Useful Resources

This section contains a list of references that may be helpful in using this guide. The references have been classified into six groups: Books, Media, Periodicals, Resource Centers, Suppliers, and Public Domain and Shareware Programs. Information is provided to help in the location of the materials along with a brief description of each reference.

In each reference, with the exception Public Domain and Shareware Programs, a "Unit" is listed. This refers to one or more of the twelve instructional units in the Teacher Guide. Abbreviated terms are used to represent the units. The terms used are as follows:

Unit	**1.**	Overview of Communication Technology	**Overview**
Unit	**2.**	Signs, Symbols and Technical Drawing	**Drafting**
Unit	**3.**	Printing Systems for Communication	**Printing**
Unit	**4.**	Photographic Systems of Communication	**Photography**
Unit	**5.**	Telecommunications-Hardwired Systems	**Hardwire**
Unit	**6.**	Telecommunications-Electromagnetic Systems	**Radio**
Unit	**7.**	Storage and Retrieval Systems	**Storage/Retrieval**
Unit	**8.**	Telecommunications-Audio/Visual Systems	**Video**
Unit	**9.**	Careers in the Communication Fields	**Careers**
Unit	**10.**	Technical Procedures in Communication	**Procedures**
Unit	**11.**	Leadership in Communication	**Leadership**
Unit	**12.**	Future Trends in Communication Technology	**Future**

The Public Domain and Shareware Section gives a listing of sources for educational public domain and shareware programs. Individual programs have not been listed. These sources typically supply catalogs containing their products upon request. Under "Types of Software Available", is a reference indicating whether the supplier carries Public Domain or Shareware software.

Public Domain Software Disk

The disk provided at the end of this curriculum guide contains a collection of public domain programs in several communication technology subject areas. These programs *are not* copyrighted. Their authors have entered them into the public domain for free use by the general public.

Each program on the self-booting disk has been designated to operate in a 128k Apple IIc/e/gs or other compatible computer. The purpose for inclusion of the disk is to emphasize that computer technology is an indispensable part of communication technology, while at the same time providing some programs that may be useful teaching aids.

Be aware that these are free public domain programs and that they may have only limited applications. We suggest that you look for more. It is our hope that you may find some of these programs relevant and useful in your classroom.

Disclaimer: These programs are provided as a service to the profession. The University of Missouri-Columbia, the Missouri Department of Elementary and Secondary Education, The Instructional Materials Laboratory and the project staff are not responsible for any problems that might arise from their use. The program authors have entered them into the public domain in the same spirit. Shareware programs must be acknowledged and paid for as per the instructions that display when they are run. If you choose not to keep a shareware program it should be deleted from the disk.

Bailey & Holloway (1984). The Book of Color Photography. Alfred A. Knopf Inc., New York, NY. Unit: Photography.
Description: Beginning photography.

Bame, A.E. & Cummings, P. (1988). Exploring Technology. Davis Publications Inc., Worcester, MA. Unit: Overview.
Description: Introductory technology textbook.

Bame, A.E. & Cummings, P. (1989). Exploring Technology: A Guide For Teachers. Davis Publications Inc. Worester, MA
Unit: Overview. Description: Technology textbook teacher's guide.

Barden, R. & Hacker, M. (1990). Communication Technology. Delmar Publishers Inc, Albany, NY. Unit: Overview.
Description: Textbook overview of communication technology.

Barron, I. & Curnow, R. (1979). The Future With Microelectronics. Nichols Publishing Co., New York, NY. Unit: Future
Description: n.a.

Bequai, A. (1987). Technocrimes. DC Health & Co., Lexington, MA. Unit: Hardwire. Description: Book of computer crimes.

Berger, E., DuVal, J. & Maughan, G. (1981). Getting The Message. Davis Publications Inc., Worcester, MA. Unit: Overview.
Description: The tecnology of communications.

Bernard, J. (1986). A Guide To Cellular Telephones. Quantum Publishing Inc., Menodicino, CA. Unit: Hardwire.
Description: Guide to cellular telephones and their use.

Bertoline, Gary R. (1985). Fundamentals Of CAD. Delmar Publishers Inc, Albany, NY. Unit: Drafting.
Description: Basic principles of CAD.

Beville, H.M. (1988). Audience Ratings. Lawrence Erlbaum Publishers, Hillsdale, NJ. Unit: Video, Radio.
Description: TV radio and cable ratings methods and influences.

Blaker, A. (1988). Photography, Art & Technique. Butterworth Publishers, Stoneham, MA. Unit: Photography
Description: Guide to photographic tecniques.

Blyth, J. & Blyth, M. (1985). Telecommunications Concepts, Development, And Management.
Bobbs-Merril Educational Publishing, Indianapolis, IN. Unit: Hardwire. Description: n.a.

Bond, A. (1974). The Video Handbook. Media Horizons Publishing Co., New York, NY. Unit: Video.
Description: Video tape recording.

Bowen, C. & Payton, D. (1986). How To Get The Most Out Of Compuserve. Bantam Books, New York, NY. Unit: Hardwire.
Description: Online data processing.

Bowen, C. & Payton, D. (1985). How To Get The Most Out Of The Source. Bantam Books, New York, NY. Unit: Hardwire.
Description: Online data processing.

Boyd, W. (n/a). Fiber Optics. Creative Learning Systems Inc., San Deigo, CA. Unit: Hardwire.
Description: Eight fiberoptics experiments.

Boyd, W.T. (1982). Fiber Optics Communication: Experiments & Projects. Howard W. Sams, Indianapolis, IN
Unit: Hardwire. Description: Experiments, basic principles, development & usefulness of fiber optics.

Breyer, R. & Moller, P. (1984). Making Television Programs. Longman Publishing Co., New York, NY. Unit: Video.
Description: Television production and direction.

Brodhead Garrett Co. (1986). Laser Optics And Communications. Brodhead Garrett Co., Cleveland, OH. Unit: Hardwire.
Description: Operation Manual for Brodhead Garrett laser.

Brown, R.M. (1968). The VHF Amateur. Editors And Engineers LTD, New Augusta, IN. Unit: Radio.
Description: Overview of VHF transmision.

Brown, Walter C. (1984). Blueprint Reading For Industry. Goodhart Willcox Co Inc, South Holland, IL. Unit: Drafting.
Description: Basic blueprint reading, write-in text.

Brown, Walter C. (1984). Drafting For Industry. Goodhart Willcox Co Inc, South Holland, IL. Unit: Drafting.
Description: Basic drafting textbook, includes workbook.

Burden, R. & Hacker, M. (1990). Communication Technology. Delmar Publishers Inc., Albany , NY. Unit: Overview.
Description: Textbook, overview of communication technology.

Burke, H.E. (1984). Handbook Of Bar Coding. VanNostrand Reinhold, New York, NY. Unit: Hardwire.
Description: Explains what bar codes are and how they are used.

Butterfield, M. & Peach, S. (1987). Photography From Beginning To End. EDC, n/a, n/a. Unit: Photography.
Description: Beginner's guide to photography.

Butterfield, M. & Peach, S. (1987). Useborne Guide To Photography. Useborne Publishing LTD, London , UK.
Unit: Photography. Description: Principles of photography.

Cambron, J. (1984). The First Primer Of Microcomputer Telecommunications. TAB Books Inc, Blue Ridge Summit, PA.
Unit: Hardwire. Description: Basic guide to telecommunications.

Campbell, M.F. & Campbell, R.C. (1989). Computer Applications Activity Kit. Prentice-Hall Inc, Englewood Cliffs, NJ.
Unit: Hardwire. Description: Source of computer application worksheets.

Cannon, D.L. & Luecke, G. (1984). Understanding Communication Systems. Howard W. Sams, Indianapolis , IN.
Unit: Overview. Description: Fundamental facts about communications systems.

Cantor, M.G. (1971). The Hollywood TV Producer. Transaction Books, New Brunswik, NJ. Unit: Video.
Description: Profile of TV producer's job and responsibilities.

Caristi, A.J. (1986). Electronic Telephone Projects. Howard W. Sams, Indianapolis , IN. Unit: Hardwire.
Description: n.a.

Casson, H. (1971). The History Of The Telephone. Books For Libraries Press, Freeport, NY. Unit: Hardwire.
Description: History Of The Telephone.

Certron, M. & O'Tool, T. (1982). Encounters With The Future. McGraw-Hill, New York , NY. Unit: Future.
Description: A forecast of life in the 21st century.

Chorotas, D.N. (1984). Telephone Today And Tomorrow. Prentice-Hall Inc, Englewood Cliffs, NJ. Unit: Hardwire.
Description: Technological inovations of telecommunications.

Chowenhill & Wallach (1989). Drafting In A Computer Age. Delmar Publishers Inc, Albany, NY. Unit: Drafting.
Description: Basic CAD skills textbook.

Christie, L.G. (1986). Managing Tomorrow Today With On-Line Information. Dow Jones Irwin, Homewood , IL.
Unit: Hardwire, Radio. Description: Online data processing.

Clemmeuser, J. (1989). Telecommunications Education. International Communications Association 1989, Dallas, TX.
Unit: Video. Description: n.a..

Cloghessy, F., Ritz, J. & Seymour, R. (1987). Exploring Communication. Goodhart Willcox Co Inc, South Holland , IL.
Unit: Overview. Description: Introductory level textbook and workbook in communications.

Coe, D. (1967). Marconi: Pioneer of Radio. Julian Messner Inc., New York, NY. Unit: Radio.
Description: Biography of Marconi's inventive years.

Coll, S. (1986). The Deal of the Century the Breakup of AT&T. Westchester Book Composition inc., Yorktown Heights, NY. Unit: Hardwire. Description: Breakup of AT&T.

Compton, Current, Stroebel & Zakia (1986). Photographic Materials and Processes. Focal Press, Boston, MA. Unit: Photography. Description: Detailed overview of photographic materials & processes.

Connell & Galbraith (1983). Electronic Mail. VanNostrand Reinhold Co., New York , NY. Unit: Hardwire. Description: Overview of electronic mail systems.

Cooper, R.E. (1990). Introduction to Versacad. Merrill Publishing Co., Columbus, OH. Unit: Drafting. Description: Versacad textbook.

Craven, George (1975). Object and Image: An Introduction to Photography. Prentice-Hall Inc, Englewood Cliffs, NJ. Unit: Photography. Description: Introductory photographic text.

Cross & Raizman (1986). Networking An Electronic Mail Handbook. Scott, Foresman & Co., Glenview, IL. Unit: Hardwire. Description: An introduction to electronic mail.

Curl, D. (1979). Photocommunications, A Guide to Creative Photography. McMillan Publishing Co, New York, NY. Unit: Photography. Description: Guide to creative photography.

D'Lgnazio, F. (1981). Creative Kids Guide To Home Computers. Double Day, New York, NY. Unit: Hardwire, Radio. Description: Kid's guide to microcomputer use.

DeBloonis, M.L. (1982). Video/Microcomputer Courseware Design. Educational Technology Publications, Englewood Cliffs, NJ. Unit: Video. Description: n.a.

deSols Pool, I. (1983). Forecasting The Telephone. Ablex Publishing Co., Norwood, NJ. Unit: Hardwire. Description: A retrospective assessment of telephone technology.

Dibner, B. (1959). The Atlantic Cable. Blaisdell Publishing Co., New York, NY. Unit: Hardwire. Description: Historical account of the laying of the Atlantic cable.

Didsbury, H.F. (1982). Communications And The Future. World Future Society, Bethesda, MD. Unit: Future. Description: Twentieth century communications forecasting.

Duelm, Brian L. (1989). Computer-Aided Drafting. Goodhart Willcox Co Inc, South Holland, IL. Unit: Drafting. Description: CAD textbook and student workbook.

Duelm,B.L. (1989). Computer-Aided Drafting: Fundamentals and Applications. Goodhart Willcox Co Inc, South Holland , IL. Unit: Drafting. Description: CAD textbook.

Dulap, O.E. (1938). Marconi: The Man And His Works. McMillan Publishing Co, New York, NY. Unit: Radio. Description: Successes and failures of Marconi's early inventions.

Earle, J.H. (1987). Engineering Design Graphics. Addison-Wesley Publishing Co., New York, NY. Unit: Drafting. Description: Advanced textook in design graphics.

Eastman Kodak Co (1977). Encyclopedia of Practical Photography. American Photographic Book Publishing Co., Garden City, NY. Unit: Photography. Description: Basic photography.

Eastman Kodak Co (1975). Creative Darkroom Techiniques. Eastman Kodak Co, Rochester , NY. Unit: Photography. Description: Guide to darkroom techniques.

Eastwood, E. ((n/a)). Wireless Telegraphy. John Wiley & Sons, New York , NY. Unit: Overview. Description: Overview of the early history and development of wireless communications.

Eide, A. (1984). Engineering Graphics Fundamentals. McGraw-Hill Inc., Hightown, NJ. Unit: Drafting.
Description: Textbook of engineering graphics fundamentals.

Elion, G.R. & Elion, H.A. (1978). Fiber Optics In Communications Systems. Marcel Dekker Inc., New York, NY.
Unit: Hardwire. Description: Detailed book of fiber optics.

Elseman, M. (1985). How To Get Your First Job. Crown Publishers Inc., New York, NY. Unit: Careers.
Description: A guide to getting your first job.

Epler, D.M. (1989). Online Searching Goes To School. Oryx Press, Phoenix, AZ. Unit: Hardwire, Radio.
Description: Guide to school library computer reference.

Erickson, F.J., & Isaak, T.J. (1990). Easy Ventura. Merrill Publishing Co., Columbus, OH. Unit: Printing.
Description: Guide to learning Ventura desktop publishing.

Erickson, J. & Cramer, W. (1985). Mactelecommunications. McGraw-Hill Inc., New York, NY. Unit: Hardwire.
Description: Macintosh telecommunications.

Evansen, V.B. & Wolfers, E.E. (1980). Organizations Clubs And Action Groups. St. Martin's Press, New York, NY.
Unit: Leadership. Description: How to start and run clubs and organizations.

Evens, D.S. (1983). Breaking Up Bell. North Holland, New York, NY. Unit: Hardwire.
Description: Essays on Bell's industrial organization.

Fales, J.F., Kuetemeyer, V.F. & Brusec, S. (1988). Technology: Today and Tomorrow. Glencoe Publishing Co., Mission Hills,
CA. Unit: Overview. Description: Textbook dealing with concepts in technology.

Feather, F. (1980). Through The 80's: Thinking Globally, Acting Locally. World Future Society, Bethesda, MD.
Unit: Future. Description: Twentieth century communications forecasting.

Feirer, J.L. & Groneman, C.H. (1986). General Industrial Education and Technology. McGraw-Hill inc., New York, NY.
Unit: Overview. Description: General technology textbook.

Fenichel, C.H. & Hogan, T.H. (1981). Online Searching: A Primer. Learned Information, Marlton, NJ. Unit: Hardwire.
Description: Online bibliographic searching.

Ferguson, M. (1981). New Communication Technologies And The Public Interest. SAGE Publications Inc, Beverly Hills, CA.
Unit: Overview. Description: An overview of how communication technology affects people.

Fike, J.L. & Friend, G.E. (1984). Understanding Telephone Electronics. Texas Instruments, Dallas, TX. Unit: Hardwire.
Description: How telephones work.

French, L.E. (1986). Crash Course In Artifical Intelligence And Expert Systems. Howard W. Sams, Indianapolis, IN.
Unit: Storage/Retrieval. Description: n.a.

French, T., Vierck, C. & Foster, R. (1984). Graphic Science And Design. McGraw-Hill Inc., Hightown, NJ. Unit: Drafting.
Description: Drafting and Design Textbook.

Galanter, E. (1983). Kids And Computers. Putnam Publishing, New York, NY. Unit: Hardwire.
Description: Computer applications for kids.

Gallo, M.A. & Nemmo, R.B. (1985). Computer And Society With Basic And Pascal. Prindle, Weber and Schmidt, Boston,
MA. Unit: Hardwire, Radio. Description: The use of the computer in today's society.

Gerrish & Dugger (1981). Transistor Electronics. Goodhart Willcox Co Inc, South Holland, IL. Unit: Hardwire.
Description: Introduction to electrity and electronics.

Gilbert, S. (1979). Ready Set Go. Four Winds Press, New York, NY. Unit: Careers.
Description: How to find a career that is right for you.

Glossbrenner, A. (1985). Complete Handbook Of Personal Computer Communication. St. Martin's Press, New York, NY
Unit: Hardwire. Description: Handbook of PC communication techniques.

Goetsch, D.L. (1988). Microcad:Compuer-Aided Design And Drafting On Microcomputers. Prentice-Hall Inc.,
Englewood Cliffs, NJ. Unit: Drafting. Description: CAD on microcomputers.

Goetsch, D.L. & Nelso J.A. (1987). Technology and You. Delmar Publishers Inc., Albany , NY. Unit: Overview.
Description: Technology textbook.

Goetsch, David L. (1985). Computer Aided Drafting. Prentice-Hall Inc, Englewood Cliffs, NJ. Unit: Drafting.
Description: CAD textbook.

Goldman, N. (1985). Online Research And Retrieval With Microcomputers. TAB Books Inc., Blue Ridge Summit, PA.
Unit: Hardwire. Description: Online data processing.

Gradus, B. (1981). Directing The Television Commercial. Hastings House Publishing Co., New York, N.Y.. Unit: Video.
Description: Directing and producing TV commercials.

Graham & Myring (1983). Information Revolution. Useborne Publishing Ltd., London WC 9BJ England, UK.
Unit: Overview. Description: Beginners overview of communications.

Grobe, B. (1984). Basic Television And Video Systems. McGraw-Hill Inc., New York, NY. Unit: Video.
Description: Television and video textbook.

Gurrie, M.L. & O'Connor, P.J. (1986). Voice/Data Telecommunications: An Introduction To Technology.
Prentice-Hall Inc, Englewood Cliffs, NJ. Unit: Hardwire. Description: n.a.

Haas, L. (1984). Going On-Line With Your Micro. TAB Books Inc, Blue Ridge Summit, PA. Unit: Hardwire.
Description: Basics of on line data transmission.

Hacker, M. & Borden, R. (1988). Technology In Your World. Delmar Publishers Inc., Albany , NY. Unit: Overview.
Description: Textbook of overview of technology.

Hansen, J., Schlesiner, B., & Unterscher, F. (1982). Holography Handbook. Ross Books, Berkley, CA. Unit: Photography.
Description: Do it yourself holography.

Harms, H. (1988). Communication Technology Activities. Delmar Publishers Inc., Albany , NY. Unit: Overview.
Description: Six activities that can be used to teach communications tech.

Hecht, J. (1987). Understanding Fiber Optics. Howard W. Sams, Indianapolis, IN. Unit: Hardwire.
Description: Communication applications of fiber optics.

Hecht, J. (1980). The Laser Guidebook. McGraw-Hill Inc., New York, NY. Unit: Hardwire.
Description: Types , operations, data and characteristics of lasers.

Heckman, P. (1986). The Magic Of Holography. MacMillan Publishing Co., New York, NY. Unit: Photography.
Description: Science of optics and how holograms work.

Hedgecoe, J. (1976). The Book of Photography. Alfred A. Knopf Inc., New York , NY. Unit: Photography.
Description: Practical approach to photography.

Heiner, C.W. & Hendrix, W.R. (1980). People Create Technology. Davis Publications Inc., Worcester, MA. Unit: Overview.
Description: Textbook, overview of technology.

Held, G. (1988). Understanding Data Communications. Howard W. Sams, Indianapolis , IN. Unit: Overview
Description: Communication data with the use of digital signals.

Held, G. & Sarch, R. (1989). Data Communications: A Comprehensive Approach. McGraw-Hill Inc., New York, NY
Unit: Hardwire. Description: Theoretical background of telecommunications.

Hellsel & Jensen (1985). Engineering Drawing And Design. McGraw-Hill Inc., New York , NY. Unit: Drafting.
Description: Two-semester engineering drawing textbook.

Hellsel & Jensen (1985). Fundamentals of Engineering Drawing. McGraw-Hill Inc., New York, NY. Unit: Drafting.
Description: Advanced drafting textbook.

Hendricks & Sterry (1989). Communication Technology. T & E Publications, Menomonie , WI. Unit: Overview.
Description: Beginners overview of Communication Technology.

Henington, D.E. (1975). How To Read Schematic Drawings. Howard W. Sams, Indianapolis , IN. Unit: Radio.
Description: How to read schematic drawings.

Hensen, C. (1984). Microcomputer User's Guide To Information Online. Hayden Book Co., Berkley, CA. Unit: Hardwire.
Description: Guide to online data systems.

Herda, D.J. (1985). Computer Peripherals. Franklin Watts, New York , NY. Unit: Hardwire.
Description: A look at microcomputer peripherals.

Hetman, F. (1973). Society And The Assessment Of Technology. OECD, 75775 Parris CEDEX 16, France.
Unit: Overview, Procedures. Description: Premises, concepts, methodology, and application of technology.

Hindley, G. (1978). Working With Light-Sensitive Material. VanNostrand Reinhold Co., New York, NY. Unit: Photography
Description: Principles of photography.

Hirsch, R. (1988). Exploring Color Photography. Wm C. Brown, Dubuque, IA. Unit: Photography.
Description: Beginning photography.

Horendtein, Henry (1983). Black and White Photography A Basic Manual. Little, Brown & Co., Boston, MA.
Unit: Photography. Description: A beginners guide to black and white photography.

Horenstein, Henry (1977). A Technical Manual Beyond Basic Photography. Little, Brown &Co., Boston, MA.
Unit: Phototography. Description: Advanced Guide to Photography.

Houglum, R.J. (1980). Electronics: Concepts, Applications & History. Breton Publishers, Boston, MA. Unit: Radio.
Description: Description and function of significant electronic inventions.

Housel, T.J. & Dorden, W.E. (1980). Introduction To Telecommunications. Southwestern Publishing Co., West Chicago, IL.
Unit: Hardwire. Description: n.a.

Huber, D.M. (1987). Audio Production Techniques for Video. Howard W. Sams, Indianapolis , IN. Unit: Video.
Description: Audio techniques for video productions.

Hudson, H.E. (1984). When Telephones Reach The Village. Ablex Publishing Co., Norwood, NJ. Unit: Hardwire.
Description: The role of telecommunications in rural development.

Hudson, Heather E. (1989). Communication Satellites. The Free Press, New York, NY. Unit: Video, Hardwire, Radio.
Description: Overview of the use of satelites in communications systems.

Iannini, R.E. (1987). Fiberoptic Infrared And Laser Space Age Projects. TAB Books Inc., Blue Ridge Summit, PA.
Unit: Hardwire, Radio. Description: Fiberoptic experiments.

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J. C. Consultancy LTD (1986). Risk Assessment For Hazardous Installations. Pereaman Press, New York, NY Unit: Procedures. Description: Evaluating risks of industrial hazards.

Jewett, J., Shargo, J. & Yontor, B. (1980). Designing Optional Voice Networks. Telephone Publishing Corp., Chicago, IL Unit: Hardwire. Description: n.a.

Jones, R.E. & Robb, J.L. (1986). Discovering Technology Communication. Harcourt-Brace-Jovanavich Publishers, San Diego, CA. Unit: Overview. Description: Communication textbook.

Jones, R.E. & Robb, J.L. (1986). Discovering Technology Communication: Activity Guide. Harcourt-Brace-Jovanavich Publishers, San Diego, CA. Unit: Overview. Description: Communication textbook activity guide.

Jones, R.E. & Robb, J.L. (1986). Discovering Technology Communication: Teacher's Manual. Harcourt-Brace-Jovanavich Publishers, San Diego, CA. Unit: Overview. Description: Communication textbook teacher's manual.

Kahanere, L. (1983). The Phone Book. Tilden Press, n/a, n/a. Unit: Hardwire. Description: Guide to telephones and their uses.

Kasser, J. (1984). Software For Amature Radio. TAB Books Inc., Blueridge Summit, PA. Unit: Radio. Description: Use of computers for aiding amateur radio operators.

Kaufman, B. (1983). Cost Effective Telecommunications Management. VanNostrand Reinhold, New York, NY. Unit: Hardwire, Video. Description: n.a.

Keating, J. & Long, M. (1988). The World Of Satellite Television. MLE Inc., n/a, n/a. Unit: Video, Radio. Description: Guide to buying, installing, operating and maintaining TV satellite systems.

Keedy, H.F. (1988). An Introduction To CAD using Cadkey. PWS-Kent, Boston, MA. Unit: Drafting. Description: Introduction to Cadkey.

Kicklighter, Clois E. (1984). Architecture: Residential Drawing And Design. Goodhart Willcox Co Inc., South Holland, IL Unit: Drafting. Description: Basic architectural drawing textbook.

Kimmitt & Myring (1984). Lasers. Usborne Publishing LTD, London England, UK. Unit: Hardwire. Description: Introductory text explainging lasers and their use.

Kingsbury, J.E. (1972). The Telephone And Telephone Exchanges. Arno Press, New York , NY. Unit: Hardwire. Description: The invention and development of the telephone and telephone exchanges.

Kirkpatrick, J.M. (1982). Basic Industrial Drafting Skills. Wadsworth Publishing Co., Belmont, CA. Unit: Drafting. Description: Basic drafting textbook.

Kodak (1987). The New Joy Of Photography. Addison-Wesley Publishing Co., Reading, PA. Unit: Photography. Description: Beginners guide to photography.

Kranzberg, M. & Pursell, C. (1967). Technology In Western Civilization. Oxford University Press, New York, NY. Unit: Overview. Description: Review of modern industrial society.

Kruglinski, D. (1984). Guide To IBM PC Communications. McGraw-Hill Inc., New York, NY. Unit: Hardwire. Description: Telecommunications for IBM computers.

Kuecken, J.A. (1987). Fiber Optics a Revolution in Communications. TAB Books Inc., Blue Ridge Summit, PA Unit: Hardwire. Description: Technical aspects of fiber optics.

Kuenstler, G. (1988). The Desk Guide to Training and Work Assesment. Charles C. Thomas Publisher, Springfield , IL Unit: Careers. Description: Counselor's guide to work advisement.

Kurtzman, J. (1985). Future-casting. ETC Publications, n/a, n/a. Unit: Future.
Description: Techniques to identify and analyze trends to forecast the future.

Lacy, E.A. (1982). Fiber Optics. Prentice-Hall Inc., Englewood Cliffs, NJ. Unit: Hardwire.
Description: Introductory book on fiber optics.

Lamberts (1985). Online. Microsoft Press, New York , NY. Unit: Hardwire. Description: Online data processing.

Lapatine, S. (1978). Electronics In Communications. John Wiely and Sons, New York, NY. Unit: Overview.
Description: n.a.

Lee, F.E. (1985). ABC Of The Telephone: Principles And Practices. Tele Training Inc., Geneva, IL. Unit: Hardwire.
Description: n.a.

Leigh, W.E. & Doherty, M.E. (1986). Decision Support And Expert Systems. Southwestern Publishing Co., West Chicago, IL. Unit: Storage/Retrieval. Description: n.a.

Lewell, John (1985). Computer Graphics. VanNostrand Reinhold Co, New York, NY. Unit: Procedures.
Description: Overview of computer graphics.

Lieber, A. (1977). Lieber's Guide How To Organize and Run A Club. William Morrow & Co. Inc., New York, NY.
Unit: Leadership. Description: How to organize and run a club.

Lindbeck, J.R. & Lathrop, T. (1986). General Industry And Technology. Bennett and McKnight Publishing Co., Peoria, IL.
Unit: Overview. Description: Textbook, overview of industry and technology.

Lindsay, S.L. (1988). Practical Applications of Expert Systems. QED Information Science Inc., Wellesly, MA.
Unit: Storage/Retrieval. Description: n.a.

Listeer, G. (1987). Technology Activity Guide I. Delmar Publishers Inc., Albany , NY. Unit: Overview.
Description: Activity workbook for teaching technology.

Logan, B. & Moody, K. (1979). Television Awareness Training. MARC Publications, New York, NY. Unit: Video.
Description: A guide and analysis of TV viewing.

Mabon, P.C. (1975). Mission Communications. Bell Telephone Laboratories Inc, Murray Hill, NJ. Unit: Overview.
Description: History of Bell laboratories.

Macrae, D.L., Monty, M.R. & Worling, D.G. (1981). Television Production: An Introduction. Mthuen Publishing Co., New York, NY. Unit: Video. Description: Television production and direction.

Marcus, A. & Marcus, W. (1973). Elements Of Radio. Prentice-Hall Inc., Englewood Cliffs, NJ. Unit: Radio.
Description: Description of technical components and devices of radio.

Mauder, J. (1978). Four Arguments For The Elimination Of Television. Marrow Quill Paperbacks, New York, NY.
Unit: Video. Description: Four arguments for the elimination of television.

Mayer, I. (1985). The Electronic Mailbox. Hayden Book Co., Hasbrouck Heights, NJ. Unit: Hardwire.
Description: Evaluation of different types of electronic mailboxes.

McAleese, F.G. (1979). The Laser Experimenter's Handbook. TAB Books Inc., Blue Ridge Summit , PA. Unit: Hardwire.
Description: A learn by building course in laser technology.

McComb, G. (1988). Laser Cookbook. TAB Books Inc., Blue Ridge Summit, PA. Unit: Hardwire.
Description: Simple to advanced laser projects.

McComb, G. (1987). The Laser Cookbook. TAB Books Inc., Blue Ridge Summit, PA. Unit: Hardwire, Radio.
Description: Book of laser experiments.

McIntire, T.C. (1978). Software Interpreters For Microcomputers. John Wiley & Sons, New York, NY. Unit: Hardwire.
Description: Translating nonmachine language to machine language.

Medford, D. (1973). Environmental Harassment Or Technological Assessment. Elsevier Science Publishing Co., New York, NY. Unit: Procedures. Description: Methods and purpose of technology assessment.

Millerson, G. (1985). The Technique Of Television Production. Focal Press, Boston, MA. Unit: Video.
Description: Techniques of TV and video production.

Mims, F.M. (1982). Easy To Understand Guide To Home Computers. Publications International LTD, New York , NY.
Unit: Hardwire. Description: Introduction to PCs.

Mintern, H. (1983). Science in Action-Television and Video. Warwick Press, New York, NY. Unit: Video.
Description: Beginners overview to TV & Video Concepts.

Minton, G.D. & Minton B.K. (1987). Teaching Technology To Children. Davis Publications Inc., Worcester, MA.
Unit: Overview. Description: Technology textbook for elementary students.

Moore & Simon (1978). First Lessons in Black and White Photography. Holt, Rinehart & Winston, New York, NY.
Unit: Photography. Description: Begining text pertaining to black and white photography.

Morris, J. (1985). Guide To Photography. Bennett and McKnight Publishing Co., Peoria, IL. Unit: Photography.
Description: Principles of photography.

Mortensen (1989). Computer Graphics an Introduction to the Mathematics and Geometry. Industrial Press Inc., New York, NY. Unit: Drafting, Printing. Description: An introduction to technical aspects of computer graphics.

Muse, Ken (1972). Basic Photo Text: Photo One. Prentice-Hall Inc., Englewood Cliffs, NJ. Unit: Photography.
Description: Simplified photography text.

Myers, R.E. (1982). Microcomputer Graphics. Addison Wesley Publishing Co., Reading, MA. Unit: Drafting.
Description: Computer graphics for the home computer.

n/a (1978). The Radio Amateur's Handbook. American Radio League, Newington , CT. Unit: Radio.
Description: Standard manual of amateur radio communication.

n/a (1968). 101 Questions And Answers About Fixed Radiocommunications. Howard W. Sams, Indianapolis , IN. Unit: Radio.
Description: Questions and answers regarding radio technology.

n/a (1990). The College Blue Book. MacMillan Publishing Co., New York, NY. Unit: Careers.
Description: List of degreas offered by college and subject.

n/a (n.d.). TSA Competitive Events Guidelines. Technology Student Association, Reston, VA. Unit: Leadership.
Description: Guidelines for competing in TSA events.

n/a (n.d.). TSA Technology Students Guide. Technology Student Association, Reston, VA. Unit: Leadership.
Description: Student guide to TSA membership.

Negrine, R.M. (1985). Cable Television And The Future Of Broadcasting. St. Martin's Press, New York, NY. Unit: Video.
Description: Description of the use and growth of cable TV around the world.

Noll, M.A. (1988). Introduction to Telecommunication Electronics. Artech House, Boston, MA. Unit: Hardwire.
Description: Introduction to telecommunication.

O'Conner, J.J. (1971). The Telephone And How It Works. Tilden Press, n/a, n/a. Unit: Hardwire.
Description: How telephones work.

O'Neill, G.K. (1981). 2081: A Hopeful View Of The Human Future. Simon And Schuster Publishing, New York, NY. Unit: Future. Description: Twenty first century forecasting.

Orr, W.I. (1975). Radio Handbook. Editors And Engineers, Indianapolis , IN. Unit: Radio. Description: Handbook of amateur radio cpperation.

Outwater & VanHamersveld (1974). A Guide to Practical Holography. Pentangle Press, Beverly Hills, CA. Unit: Photo. Description: Guide to holography.

Owen, J. (1985). Getting The Most From Your Computer. McGraw-Hill Inc., New York , NY. Unit: Hardwire. Description: Introduction to PCs.

Page, R. (1975). Man And Machine. Pereaman Press, New York, NY. Unit: Overview. Description: Overview of machines used in today's technology.

Page, R., Clarke, R. & Poole, J (1987). Modular Courses In Technology Problem Solving. Oliver and Boyd, Edinburgh EH1B, UK. Unit: Procedures, Leadership. Description: Workbook and teachers guide in problem solving in technology

Persel, C.W. Jr. (1981). Technology In America: A History Of Individuals & Ideas. MIT Press, Cambridge, MA. Unit: Overview. Description: 20 essays on American technology by outstanding researchers.

Peterson's guides (1990). Peterson's Guide to Four Year Colleges. Peterson's Guides Inc., Princeton, NJ. Unit: Careers. Description: Statistics and information on four year colleges.

Polman, E. (1984). Space Earth And Communication. Greenwood Press, Westport, CT. Unit: Overview. Description: Overview of satellite communications.

Prust, Z. A. (1989). Graphic Communications: The Printed Image. Goodhart Willcox Co. Inc., South Holland, IL. Unit: Printing. Description: Graphic Communications textbook.

Reichhard, D.C. (1988). Exploring Cadkey. Prentice-Hall Inc., Englewood Cliffs, NJ. Unit: Drafting. Description: Introduction to Cadkey.

Resnick, E. (1984). Graphic Design. Prentice-Hall Inc., Englewood Cliffs, NJ. Unit: Overview, Photography, Printing. Description: Overview of graphic communication.

Robert, H.M. III (1984). Robert's Rules Of Order. Scott, Foresman & Co., Glenview, IL. Unit: Leadership. Description: Parliamentary procedure.

Rogers, E. M. (1986). Communications Technology The New Media In Society. The Free Press, New York, NY. Unit: Overview. Description: Overview Of communications past and present.

Rogers, Everett M. (1986). Communication Technology Vol I. The Free Press, New York, NY. Unit: Overview. Description: History of communication technology and its effect on society.

Rosenthal, M.P. (1965). Fundamentals Of Radio. John F. Rider Publishing Inc., New York, NY. Unit: Radio. Description: Fundamental principles of radios.

Safford, E. Jr. (n/d). The Fiber Optics And Laser Handbook. Creative Learning Systems Inc., San Diego, CA. Unit: Hardw. Description: State of the art details of lasers and fiber optics.

Schone, P. (1972;. Science Fun Experiments in Optics. Logix Enterprises LTD, Montreal, Canada. Unit: Photography. Description: Elementary experiments in optics.

Schwaderer, W.D. (1986). Modems And Comunications On IBM. John Wiley & Sons, New York , NY. Unit: Hardwire. Description: Use of modems and electronic components by IBMs.

Schwaderer, W.D. (1989). IBM's Local Area Networks. VanNostrand Reinhold, New York, NY. Unit: Hardwire. Description: IBM power networking and systems connectivity.

Schwing, R.C. & Albers, W.A. (1980). Social Risk Assessment. Plenum Press, New York, NY. Unit: Procedures. Description: Discussion of socially acceptable levels of risk.

Scoby, M. (1968). Teaching Children About Technology. McKnight & McKnight Publishing Co., Bloomington , IL. Unit: Overview. Description: A guide to teaching technology.

Shelly, G.B. & Cashman, T.J. (1984). Computer Fundamentals for an Information Age. Anaheim Publishing Co. Inc., Brea, CA., Unit: Storage/Retrieval. Description: Electronic data processing.

Sherman, K. (1984). Data Communication: A Users Guide. Reston Publishing Co., Reston , VA. Unit: Hardwire. Description: Detailed text on data communications over telephones.

Shumaker, M.T. & Madison, D.A. (1989). Autocad and its Applications. Goodhart Willcox Co Inc., South Holland, IL. Unit: Drafting. Description: Autocad textbook.

Stager, R.A., Wales, C.E. (1978). The Instructional Design Library Vol. 9. Educational Technology Publications, Englewood Cliffs, NJ. Unit: Procedures, Leadership. Description: Educational design to teach decision making.

Stanley, J.A. (1963). Electronics For The Beginner. Babbs-Menill Co. Inc., New York, NY. Unit: Radio. Description: Beginner's electronics text.

Strandh (1979). A History Of The Machine. A & W Publishers Inc., New York, NY. Unit: Overview. Description: Development of industry.

Sutton, C. (1981). How Do They Do That?. William Morrow & Co. Inc., New York, NY. Unit: Overview. Description: Explanation of some of the interesting marvels of technology.

Swedland, C. (1973). Photography, A Handbook of History, Materials & Processes. Holt, Rinehart & Winston, New York, NY. Unit: Photography. Description: A history and guide to photography.

Swernofsky, N. (1989). Making Technology Work. Delmar Publishers Inc., Albany , NY. Unit: Overview. Description: Teacher's guide to teaching technology education.

Szykitka, W. (1978). How To Be Your Own Boss. New American Library Inc., New York, NY. Unit: Careers. Description: Handbook for starting and running a small business.

Tate, C. (1971). Cable Television In The Cities. The Urban Institute, Washington , DC. Unit: Video. Description: Cable TV and its place in our society.

Teich, A.H. (1981). Technology And Man's Future. St. Martin's Press, New York, NY. Unit: Overview. Description: Man's interaction with technology in the future.

Thurston, G. (1969). The Radio Amateur's Operator's Manual. American Radio League, Newington , CT. Unit: Radio. Description: Ham radio operator's manual.

Todd & McCrory (1985). Understanding and Using Technology. Davis Publications Inc., Worcester, MA. Unit: Overview. Description: Technology text, workbook & teacher's guide.

Upton & Upton (1989). Photography. Scott, Foresman & Co., Glenview, IL. Unit: Photography. Description: Beginner's overview to photography.

US Dept. Of Labor (n/d). Occupational Outlook Handbook. Bureau of Labor Statistics, Washington, DC. Unit: Careers. Description: Source of career information.

US Dept. Of Labor (1988). Dictionary Of Occupational Titles. US Goverment Printing Offices, Washington, DC
Unit: Careers. Description: Definitions of occupational titles.

Utx, P. (1989). Video User's Handbook. Prentice-Hall Inc., Englewood Cliffs, NJ. Unit: Video
Description: Guide to operating and maintaining video equipment.

Veith, R.H. (1983). Television's Teletext. Elsevier Science Publishing Co., New York, NY. Unit: Video
Description: Nature and uses of teletext around the world.

Veljkov, M.D. (1988). Mac Lans Local Area Networking With The Macintosh. Scott, Foresman & Co., Glenview, IL.
Unit: Hardwire. Description: Description of local area networking with the Macintosh

Voisinet, Donald D. (1983). Introducing CAD. McGraw-Hill Inc., New York, NY. Unit: Drafting.
Description: Introduction to CAD.

Vol 18 (1987). Encyclopedia of Science and Technology. McGraw-Hill Inc., Hightown, NJ. Unit: Overview.
Description: Encyclopedia of science and technology concepts.

Walker & Walker (1987). Exploring Photography. Goodhart Willcox Co Inc., South Holland, IL. Unit: Photography
Description: Beginner's textbook, workbook also available.

Walker, John R. (1989). Exploring Drafting. Goodhart Willcox Co Inc., South Holland, IL. Unit: Drafting.
Description: Drafting fundamentals textbook.

Walker, John R. (1986). Graphic Arts Fundamentals. Goodhart Willcox Co Inc., South Holland, IL. Unit: Drafting
Description: Graphic arts textbook, includes student workbook.

Whaley, C.E. (1987). Future Studies. Trillium Press Inc., Monroe , NY. Unit: Future.
Description: Study of future trends.

Whaley, C.E. (1984). Futures Studies: Personal & Global Possibilities. Trillium Press Inc., Monroe , NY. Unit: Future.
Description: Teacher's handbook on futurism.

Whinnery, J.R. (1987). Lasers: Invention To Application. National Academic Press, n/a, n/a. Unit: Hardwire.
Description: History and use of the laser.

Willams (1987). Technology At Work. South-Western, n/a, n/a. Unit: Overview.
Description: Textbook overview of technology.

Williams, G.E. (1979). Electronics For Everybody. Science Research Associates Inc., Chicago, IL. Unit: Radio.
Description: Beginner's electronics text.

Wolfe, G.W. (1986). Computer Peripherals That You Can Build. TAB Books Inc., Blue Ridge Summit, PA.
Unit: Hardwire, Radio. Description: Peripherals you can build.

Yob, P. (1973). Photo Equipment You Can Make. Peterson Publishing Co. Los Angeles, CA. Unit: Photography
Description: Plans and procedures for making photo equipment.

Zettl, H. (1984). Television Production Handbook. Wadsworth Publishing Co., Belmont, CA. Unit: Video.
Description: Television production textbook.

(1980). Laser Electro-Optics Cumulative Guide. Center For Occupational Research And Development, Waco, TX.
Unit: Hardwire. Description: n.a.

Agency for Instructional Technology, Box A, 1111 West 17th St., Bloomington, IN 47402 C-1 (Exploring Technology Education, Section B, Communication: Videos).

Advanced Photography 2-Nature, (1985) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester , NY 14650
Description: Follows four wildlife photographers as they explore the world of animals, flowers & insects

Advanced Photography 3-Scenics, (1985) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Program follows scenic photographer Abi Garaman through the Grand Tetons.

Advanced Photography 4-The Way I See It, (1985) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Four experienced photographers talk about their work and "tricks of the trade"

Aluminum Plate Lithography, (1981) Media, VHS 56min. Unit: Printing,
Ritchie's Video, Seattle, WA 98109
Description: Dwight Coburn demonstrates the details of aluminum plate lithography

Art And Technique Of Photo-Engraving, (1963) Media, 16mm 25min. Unit: Printing,
Horan Engraving Co, New York, NY 10001
Description: Tour through Horan plant showing all the steps involved in photo-engraving

Big City Newspaper, (1970) Media, 16mm 27min. Unit: Printing,
Avon Productions Inc., Chicago, IL
Description: Step by step production and distribution of a newspaper.

Cable-A Special Just For You, (1989) Media, VHS 11min. Unit: Video,
National Cable TV Assoc, Washington', DC 20036
Description: Examines Aspects of the cable industry vital to both consumers and decision makers.

Communications: The Printed Word, (1971) Media, 16mm 18min. Unit: Printing,
Informational Material Inc , Burbank, CA 91506
Description: Traces the history of printing.

Creating With The Arts-Print Making, (1983) Media, VHS 38min. Unit: Printing,
The Communicad Academy, Wilton , CT 06897
Description: History and techniques of printing including relief, intaglio,lithograph and silk screen.

Engineering Drawing 1-Drafting Tools/Equipment, (1987) Media, VHS 25min. Unit: Drafting,
Hearlihy and Co, Springfield, OH 45501
Description: Review of basic drafting tools and uses to draw straight lines.

Engineering Drawing 2-Drafting Tools/Equipment, (1987) Media, VHS 25min. Unit: Drafting,
Hearlihy and Co., Springfield, OH 45501
Description: Use of basic drafting tools to draw circles, arcs,and curves.

Engineering Drawing 3-Basic Graphic Principles, (1987) Media, VHS 25min. Unit: Drafting,
Hearlihy and Co., Springfield, OH 45501
Description: Discussion of isometric, oblique, perspective , pictoral and multiview drawings.

Engineering Drawing 4-Multiview Drawings, (1987) Media, VHS 25min. Unit: Drafting,
Hearlihy and Co., Springfield, OH 45501
Description: Principles used to produce an orthographic projectioin drawing.

Engineering Drawing 5-Dimensioning, (1987) Media, VHS 25min. Unit: Drafting,
Hearlihy and Co., Springfield, OH 45501
Description: Principles as stated in ANSI standards.

Engineering Drawing 6-Section Views, (1987) Media, VHS 25min. Unit: Drafting,
Hearlihy and Co., Springfield, OH 45501
Description: Explanation of all types of section views through use of manual and computer graphics.

Etching And Color Intaglio, (1973) Media, VHS 38min. Unit: Printing,
Mason Kennedy, Portland, OR 97208
Description: A look at plate preparation and techniques for etching and printing.

Exploring Photography 11-Using Flash, (1986) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Demonstrates flash techniques and uses.

Exploring Photography 12-Action, (1986) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: A look at lenses, film and techniques used in action photography.

Exploring Photography 3-Composition, (1986) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Values of strong composition, six simple guidelines given for better composition.

Exploring Photography 4-Lenses, (1986) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Use of normal, wide angle and telephoto lense.

Exploring Photography 6-Filters, (1986) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Demonstrates uses and effects of photographic lense filters.

Exploring Photography 9-People, (1986) Media, VHS 30min. Unit: Photography,
Kodak Video Exchange, Rochester, NY 14650
Description: Demonstrates techniques in photographing people.

Finelight 1-Commercial Illustrator/Table Top, (1987) Media, VHS n/a. Unit: Photography,
Finelight, Lemon Grove, CA 92045
Description: Dean Collins demonstrates both table top and product suspension techniques.

Finelight 2- Commercial Illustrator/Large Scale, (1987) Media, VHS n/a. Unit: Photography,
Finelight, Lemon Grove, CA 92045
Description: Creation and manipulation of environment on large productions.

Finelight 3-Contemporary Portraiture, (1987) Media, VHS n/a. Unit: Photography,
Finelight, Lemon Grove, CA 92045
Description: Basics of lighting subjects, and exposure control through developing.

Finelight 4-Contemporary/Portraiture/Studio, (1987) Media, VHS n/a. Unit: Photography,
Finelight, Lemon Grove, CA 92045
Description: Commercial Portraiture is explored in detail.

Finelight 5-Commercial Portaiture On Location, (1987) Media, VHS n/a. Unit: Photography,
Finelight, Lemon Grove, CA 92045
Description: Covers the specifics of three different commercial/environmental shots.

Finelight 7-Table Top Chromazones, (1987) Media, VHS n/a. Unit: Photography,
Finelight, Lemon Grove, CA 92045
Description: Covers techniques involved in creation of striking commercial table top photography.

Graphic Data Processing, (1970) Media, 16mm 40min. Unit: Procedures, Hardwire,
Magnetic Media Division/3M, St. Paul, MN 55133
Description: Use of computer in engineering.

If One Today-Two Tomorrow, (1976) Media, 16mm n/a. Unit: Radio, Video,
George Marshall Space Flight Center, Marshall Space Flight Center, AL 35812
Description: Addresses the need for worldwide communication and how radio, TV and communication satellites ar

Images Of The Masters 1-Creating The Image, (1987) Media, VHS 40min. Unit: Photography,
Kodak Video Programs, Rochester , NY 14650
Description: Professional photography techniques used in black and white photography.

Images Of The Masters 2-Creating The Print, (1987) Media, VHS 45min. Unit: Photography,
Kodak Video Programs, Rochester , NY 14650
Description: Professional darkroom techniques used to produce award winning photos.

Introduction To The Camera And Darkroom, (1985) Media, VHS 38min. Unit: Photography,
Sreen Printing Association International, ,
Description: Introduction to the use of the camera asnd film processing.

Lasercom, (1978) Media, 16mm n/a. Unit: Video,
McDonald Douglas Film Library, St. Louis, MO 63166
Description: Discusses laser communications and its application to space communications.

On Assignment 1-Photographic Light, (1986) Media, VHS 90min. Unit: Photography,
Midwest Media, Beaverton, OR 97005
Description: Explores light, exposure control, and methods of lighting.

On Assignment 2-Photographic Design, (1986) Media, VHS 90min. Unit: Photography,
Midwest Media, Beaverton, OR 97005
Description: Principles of good photographic design.

On Becoming A Desk Top Publisher 1, (1987) Media, VHS 35min. Unit: Procedures, Hardwire,
Ocean Communications, San Jose, CA 95112
Description: Which computer is right for you, key elements of desk top publishing.

On Becoming A Desk Top Publisher 2, (1987) Media, VHS 80min. Unit: Procedures, Hardwire, Printing,
Ocean Communications, San Jose, CA 95112
Description: Demonstrates hardware and software products.

Opportunities In Graphic Communications, (n/a) Media, VHS 15min. Unit: Overview,
Modern Talking Picture Services Inc, St. Petersburg , FL 33709
Description: Introduction to career opportunities in graphic communications. Free discussion material provided.

Planning And Preparing For Production, (1986) Media, VHS n/a. Unit: Video,
Magnetic Media Division/3M, St. Paul, MN 55133
Description: Shows importance of production plan to organize video project.

Preforming On TV, (1986) Media, VHS n/a. Unit: Video,
Magnetic Media Division/3M, St. Paul, MN 55133
Description: Correct speaking style & how to structure content in video a production.

Print Making-Four Artists, Four Media, (1968) Media, 16mm 19min Unit: Printing,
BFA, Santa Monica, CA 90404
Description: Four different print makers and their work.

Production Tips, (1986) Media, VHS n/a. Unit: Video,
Magnetic Media Division/3M, St. Paul, MN 55133
Description: Details that go into a professional-appearing video production

Putting Your Production On Screen, (1986) Media, VHS n/a. Unit: Video,
Magnetic Media Division/3M, St. Paul, MN 55133
Description: Demonstrates role of director in selecting setting for production

Secrets of the E. T., (n/a) Media, VHS 15min. Unit: Overview, Hardwire,
Walter Kliene Co. LTD., Dist. Dept., Charolette, NC 28247
Description: Presents uses and abilities of the electric typewriter.

Television: Revolution In A Box, (1989) Media, VHS 50min. Unit: Video,
Corronet/MTI Films & Video, Dearfield, IL 60015
Description: Use of TV to initiate social and economic change.

The Searching Eye , (1987) Media, VHS 24min. Unit: Photography,
Media Loft, Minneqapolis , MN 55441
Description: Professional photography.

Video Post-Production, (1986) Media, VHS n/a. Unit: Video,
Magnetic Media Division/3M, St. Paul, MN 55133
Description: The techniques and technology of video editing.

Whats in a name, (1978) Media, 16mm n/a. Unit: Hardwire,
McDonald Douglas Film Library, St. Louis, MO 63166
Description: MAVIS, McDonald Douglas Automated Voice Information System, supplies instant answers to phone

80 Micro, ERIC Document, na, na, na, na. Unit: Hardwire. See: Dubin, D. *Online*. Sept/Oct, 1989.
Description: Details of pin connectors on computer serial ports.

Access, Telecommunications Research and Action Center, Box 12038, Washington, DC, 20005. Unit: Video.
Description: Citizen's journal of telecommunications.

Art Production News, Grady Publishing Co., 7301 N. Woodland Dr., Indianapolis, IN, 46278. Unit: Printing.
Description: Professoinal printer journal.

AT & T Bell Laboratories Technical Journal, AT & T Co., 550 Madison Ave., New York, NY, 10022. Unit: Hardwire.
Description: Engineering aspects of electrical communications.

Broadcast Engineering, Intertec Publishing Corp., 9221 Quivira Rd., Box 12901, Overland Park, KS, 66212. Unit: Video.
Description: Journal of broadcast technology.

Business Radio, National Assoc. of Business & Educational Radio, Duke St., Suite 200, Alexandria, VA, 22314. Unit: Video.
Description: Professional broadcaster's journal.

BYTE, McGraw-Hill Inc., PO Box 551, Hightown, NJ, 01520. Unit: Hardwire. Description: PC users magazine.

Compute, Compute Publications Inc., 324 West Wendover Ave., Greensbouro, NC, 27408. Unit: Hardwire.
Description: Magazine for home PC users.

Computer, IEEE Computer Society, 10662 Los Vaqueros Circle, P.O. Box 3014, Los Alamitos, CA, 90720. Unit: Hardwire.
Description: Hardware orientation computer magazine.

Computer Buyer's Guide, Harris Publications Inc., 1115 Broadway, New York, NY, 10010. Unit: Hardwire.
Description: Computer buying guide.

Computer Design, Penwell Publishing Co., One Technology Park Drive, PO Box 990, Westford , MA, 01886. Unit: Hardwire.
Description: Magazine of system design and development.

Computerworld, Computerworld, Box 914, 375 Cochituate Rd., Farmington , MA, 01701. Unit: Hardwire.
Description: The newsweekly of information systems management.

Darkroom Photogrophy, PMS Publishing Co., One Halide Plaza, Suite 600, San Fransisco, CA, 94102. Unit: Photography.
Description: Darkroom procedures.

Datamation, Cahners Publication Co., 875 Third Ave., New York, NY, 10022. Unit: Hardwire.
Description: For general computer users.

DB. The Sound Engineering Magazine, Sagamore Publishing Co., 1120 Country Rd., Plainview, NY, 11803.
Unit: Storage/Retrieval. Description: Professional sound engineer journal.

Digital Audio Magazine, Wayne Green Enterprizes Inc., 70 Route 202 N., Peterbourgh, NC, 03458.
Unit: Storage/Retrieval. Description: Sound recording & reproduction .

ECTJ, Association For Education Communications & Technology, 1126 16th St. NW, Washington , DC, 20036. Unit: Video.
Description: Education Communications & Technology Journal.

Electronics Magazine, McGraw-Hill Inc., PO Box 551, Hightown, NJ, na. Unit: Hardwire.
Description: Home-made light communicator-reciever.

Graphic Arts Product News, Maclean Hunter Publishing Co., 29 N. Wacker Dr., Chicago, IL, 60606. Unit: Printing.
Description: Professoinal printer journal.

High Volume Printing, Innes Publishing Co., PO Box 368, Northbrook, IL, 60065. Unit: Printing.
Description: Professoinal printer journal.

History Microcomputer Review, ERIC Document, na, n/a, na, na. Unit: Hardwire. See: Locicero, S. A. *A Computer In A Scholar's Lap: Direct Transfer From Tandy 100 To Macintosh.* Description: File transfer from Tandy 100 to Macintosh

In-Plant Printer, Innes Publishing Co., PO Box 368, Northbrook, IL, 60065. Unit: Printing. Description: Professoinal printer journal.

InCider A+, IDG Communications/Peterborough Inc., 80 Elm St., Peterborough, NC, 03458. Unit: Hardwire. Description: Apple II users magazine.

Industrial Education, Cummins Publishing Co., 31600 Telegraph Rd., Birmingham, MI, 48084. Unit: Overview. Description: Practical magazine for Industrial Technology teachers.

Journal Of Film And Video, Dept. of Communication Arts & Sciences, Rosary College, 7900 W. Division St., River Forest, IL, 60305. Unit: Video. Description: Film making journal.

Macworld, Macworld Communications, PO Box 54529, Boulder, CO, 80322. Unit: Hardwire. Description: Macintosh users' magazine.

Mix, Mix Publications Inc., 2608 Ninth St., Berkley, CA, 94710. Unit: Storage/Retrieval. Description: Professional recording journal.

Modern Electronics, Modern Electronics Inc., 76 N Broadway, Hicksville, NY, 11801. Unit: Hardwire, Radio. Description: How to build and design components.

National Geographic Magazine, National Geographic Society, 17th & M St. NW, Washington, DC, 20036. Unit: Overview Description: General interest.

PC Magazine, Ziff-Davis Publishing Co., One Park Ave., New York, NY, 10016. Unit: Hardwire. Description: PC users magazine.

PC World., PCW Communications, 501 Second St., San Fransisco, CA, 94107. Unit: Hardwire. Description: PC users magazine.

Popular Communications, Popular Communications Inc., 76 N Broadway, Hicksville , NY, 11801. Unit: Hardwire, Radio. Description: Amateur communications-radio, CB, ham, Telephone.

Popular Photography, Ziff-Davis Publishing Co., One Park Ave., New York, NY, 10016. Unit: Photography. Description: Amateur photography magazine.

Printing Impressions, North American Publishing Co., 401 North Broad St., Philadelphia, PA, 19108. Unit: Printing. Description: Professoinal printer journal.

Pro Sound News, Pro Sound News Publications Inc., 2 Park Ave., New York, NY, 10016. Unit: Storage/Retrieval. Description: Professional recording journal.

Radio-Electronics, Gennsback Publishers Inc., 200 Park Ave. S., New York, NY, 10003. Unit: Radio. Description: Building radio components.

Recording Engineer-Producer, Cally Communications Inc., Box 2449, 1850 Whitley, Hollywood, CA, 90078. Unit: Storage/Retrieval. Description: Professional recording journal.

School Shop, Prakken Publications Inc., 416 Longshore Dr., AnnArbor, MI, 48107. Unit: Overview. Description: Practical magazine for Industrial Technology teachers.

Scientific American, Scientific American Inc., 415 Madison Ave., New York, NY, 10017. Unit: Overview. Description: General science and technology publication.

Shareware Magazine, Shareware Magazine, 1030 D East Duane Ave., Sunnyvale, CA, 94086. Unit: Hardwire
Description: Evaluation and listing of shareware programs.

Software News, Sentry Publishing Co. Inc., 5 Kane Industrial Dr., Hudson, MA, 07149. Unit: Hardwire.
Description: magazine of business software selection and use.

Technology Teacher, American Industrial Arts Association, 1914 Association Dr., Reston, VA, 22091. Unit: Overview
Description: Practicle magazine for Industrial Technology Teachers.

The Computing Teacher, International Society for Technology in Education, University of Oregon,
1787 Agate St., Eugene, OR, 97403. Unit: Hardwire.
Description: The Journal Of The International Society For Technology In Education .

This Month In Telecommunications, McGraw-Hill Inc., S. Franklin Tpk., Ramsey, NJ, 07446. Unit: Hardwire.
Description: Monthly magazine of telecommunications news.

TIES, Drexel University, , Philadelphia, PA, 19104. Unit: Photography. See: Dubin, D. *Online*. Sept/Oct. 1989.
Description: A history of the first 150 years of photography.

TIES, Drexel University, , Philadelphia, PA, 19104. Unit: Hardwire. See: Tobia, B. *Capturing The Image*.
May/June,1989.Description: Online data processing.

TIES, Drexel University, , Philadelphia, PA, 19104. Unit: Overview.
Description: Practicle magazine for Industrial Technology teacher.

Classroom Activities In Communications, Unit: Overview. Wisconsin Department Of Public Instruction,
125 South Webster St., Madison, WI 53707
Description: Communication activity curriculum.

Communications And Media Technology, Unit: Overview. Tennessee Department Of Education,
Nashville, TN
Description: Vocational communication curriculum guide.

Communications Technology Curriculum Guide, Unit: Overview. Illinois State School Board of Education,
100 North First St., Springfield, IL
Description: 9th & 10th grade communication curriculum.

Deversified Technology, Unit: Overview. Mississippi State Dept. of Education Vocational Bureau,
Jackson, MS62777
Description: Twenty module technology activity guide.

Exploring Communication Technology, Unit: Overview. Mid-America Vocational Curriculum Consortium Inc.,
1500 West Seventh, Stillwater, OK
Description: Communication curriculum.

Industrial Technology Education Resources 1989, Unit: Overview. Missouri Vocational Resource Center,
8 London Hall, University of Missouri, Columbia, MO 74074
Description: Instructional resources for technology education.

Michigan Technology Education Curriculum, Unit: Overview. The Michigan Vocational Education Resource Center,
133 Erickson Hall, University of Michigan, East Lansing, MI 65211
Description: Communication curriculum guide.

Telecommunications Curriculum Guide, Unit: Overview. Center For Occupational Research And Development,
601C Lake Air Drive, Waco, TX 48823
Description: Telecommunications curriculum guide.

West Virginia Industrial Arts/ Tech Communication Curriculum, Unit: Overview. Vocational Curriculum Laboratory,
Clear Lakes Conference Center, Ripley, WV 76710
Description: Communication curriculum.

Advance Process Supply Co., 1821 Linn, St. Louis, MO: Unit: Printing. Description: Screen printing supplies.

Allied Electronics Corp., 2400 Washington, Chicago, IL 60612; Unit: Hardwire, Radio.
Description: General electronics supplies.

Beseler Co., 1600 Loruer Rd, Linden, NJ 07036; Unit: Photography. Description: Photographic enlarger manufacturer.

Broadhead Garrett, 223 S. Illinois Ave., Mansfield, OH 44905; Unit: Overview.
Description: General school industrial technology supplier.

Broderbund, 17 Paul Dr., San Rafael, CA 94903; Unit: Hardwire, Printing. Description: Computer program supplier.

Claris, 440 Clyde Ave., Mountian View, CA 94043; Unit: Hardwire, Printing. Description: Computer program supplier.

Creative Leaming Sysatems Inc., 9899 Hibert St., Suite C1, San Diego, CA 92131; Unit: Overview.
Description: Textbook catalog.

Creative Learning Systems Inc., 9899 Hibert St., Suite C1, San Deigo, CA 92131; Unit: Overview.
Description: Electronics catalog.

Eastman Kodak Co., 7301 Frontage Rd. I35, Shawnee Mission, KS 66204; Unit: Photography.
Description: Technical information on photographic film and paper.

EICO, 283 Malta St., Brooklyn, NY 11207; Unit: Hardwire, Radio. Description: Electronics kit supplier.

Felix Cameras, 8787 Metcalf Ave., Overland Park, KS 66214; Unit: Photography.
Description: General photographic supplies.

Harold Pittman Co., Lenexa. KS ; Unit: Printing. Description: General printing supplies.

Heath Zenith Co., 9900 Pflum, Benton Harbor, MI ; Unit: Hardwire.Description: Individualized fiber optics course.

Heathkit, , Benton Harbor, MI 49002; Unit: Hardwire, Radio. Description: Electronics kit supplier.

Ilford Inc., Benton Harbor, Elk Grove Villiage, IL 60007; Unit: Photography.
Description: Technical information on photographic film and paper.

Independent Photo Art Supply, 555 Busse Rd., Kansas City, MO 64108; Unit: Photography.
Description: General photographic supplies.

Kelvin Electronics, 325 SW Blvd., Plaineview, NY 11803; Unit: Hardwire, Radio. Description: Electronics catalog.

Lafayette Radio Electronics, 7 Fairchild Ave., Syosset, L.I., NY 11791; Unit: Hardwire, Radio.
Description: General electronics supplies.

Lawrence Photo-Graphic Inc., 111 Jerico Turnpike, Kansa City, KS; Unit: Photography. Description: General photographic .

Lawrence Photographic, 1211 Cambridge Circle Dr., Kansas City, KS 66103; Unit: Printing.
Description: General printing supplies.

Midwest Paper, 1211 Cambridge Circle, Kansas City, MO; Unit: Printing. Description: General printing supplies.

Mouser Elecronics, 1225 Bedford, Mansfield, TX 66103; Unit: Hardwire, Radio. Description: General electronics supplies.

Newerk Electronics, 2363 Hwy 287 N,Box 719, St. Louis, MO ; Unit: Hardwire, Radio.
Description: General electronics supplies.

Olson Electronics, , Akron, OH ; Unit: Hardwire, Radio. Description: General electronics supplies.

Pioneer Electronics, 260 S Forge St., St. Louis, MO ; Unit: Hardwire, Radio. Description: General electronics supplies

Poly Parks Inc., 2029 Woodland Parkway, Suire 101, Wakefield, MA 44327; Unit: Hardwire, Radio.
Description: General electronics supplies.

Porter's Camera Store, 16 Del Carmine St., Cedar Falls, IA 63146; Unit: Photography.
Description: General photographic supplies.

Radio Shack, Box 628, Dept. 5B03, Fort Worth, TX 01880; Unit: Hardwire, Radio.
Description: Electronics kits and general electronics supplies.

Sericol, 1 Tandy Center, Kansas City, KS ; Unit: Printing.
Description: Screen printing supplies.

Southeast Technical Products Corp., 1101 W Cambridge Circle Dr., San Antonio, TX ; Unit: Hardwire, Radio.
Description: Elecrtonics kit supplier.

Section III: Resources, Part 6 Public Domain and Shareware Programs

Big Red Computer Club, 423 Norfolk Ave., Norfolk, NE 68701, Type of software available: Public Domain/Shareware.
Description: Public Domain and Shareware programs including some technology programs.

Christella Enterprise, Box 483, St. Clair Shores, MI 48080, Type of software available: Public Domain.
Description: Public Domain programs including some technology programs.

Computer Budget Shopper, 2203 Park Ave., Cheyenne, WY 82007, Type of software available: Public Domain/Sharewar.
Description: Public Domain and Shareware programs including some technology programs.

Illinois Vocational Curriculum Center, Sagamon State University F-2, Springfield, IL 62794, Type of software available:
Public Domain. Description: Public Domain technology programs.

PDE, 2074C Walsh Ave. #366, Santa Clara, CA 95050, Type of software available: Public Domain.
Description: Public Domain programs including some technology programs.

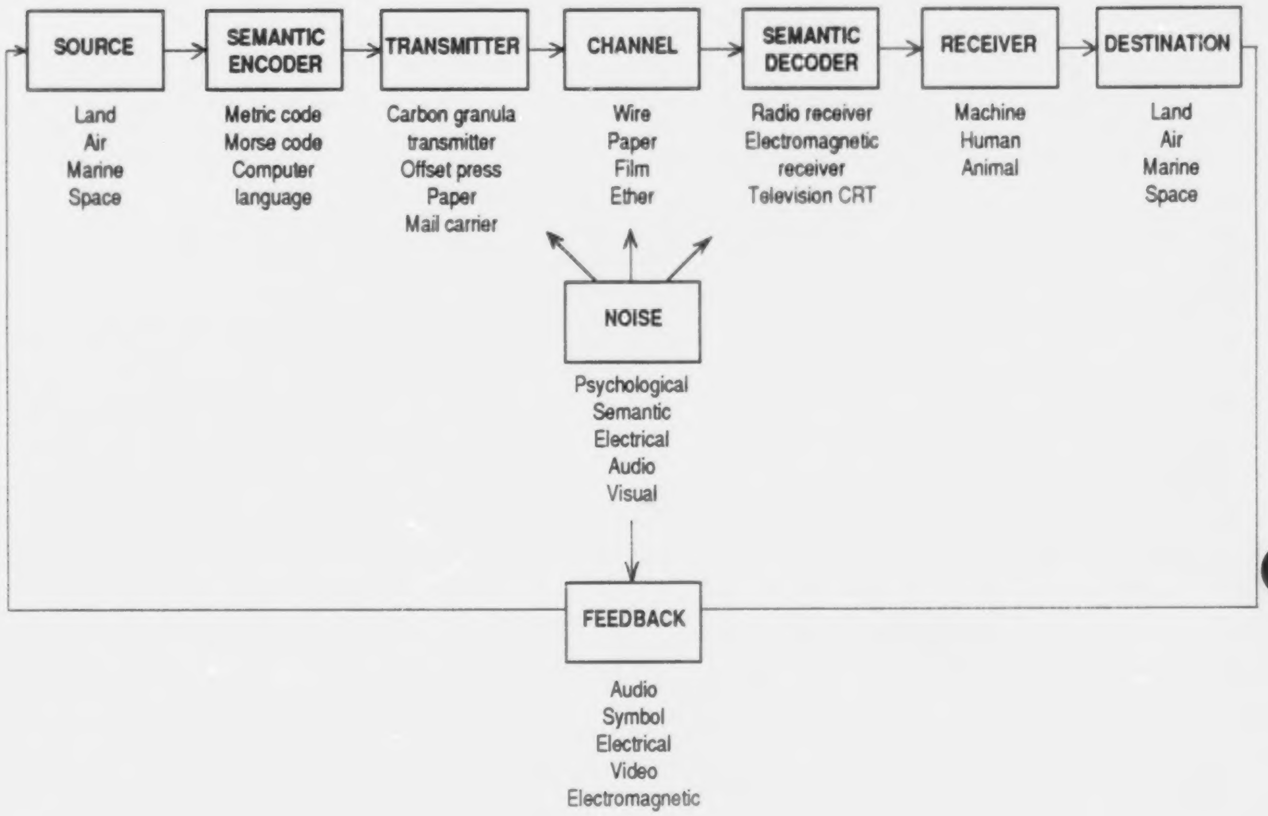
Public Brand Software, Box 51315, Indianapolis, IN 46251, Type of software available: Shareware.
Description: Large variety of shareware programs including some technology programs.

Reasonable Solutions, 2101 West Main St., Medford, OR 97501, Type of software available: Shareware.
Description: Variety of shareware programs including some technology applications.

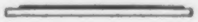
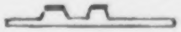
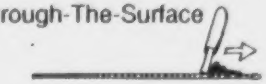
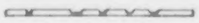
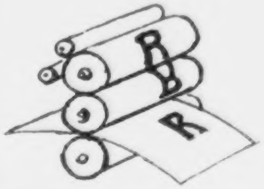
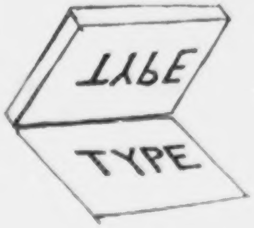
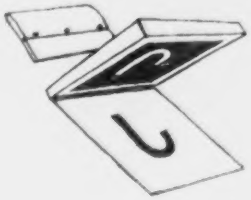
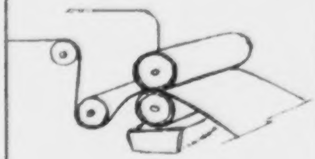
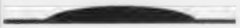
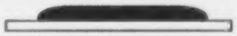
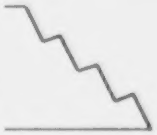
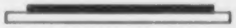
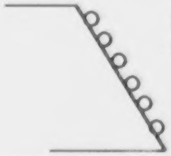
State Department of Public Instruction; Publications Section, Grimes State Office Building, Des Moines, IA 50319,
Type of software available: Public Domain. Description: Technology Public Domain software.

Technology Education Software Bank, 190 West 19th Ave., Columbus, OH 43210, Type of software available:
Public Domain/Shareware. Description: Large variety of technology Public Domain and Shareware.

Component Parts of Any Communication System


SOURCE
Land
Air
Marine
Space
SEMANTIC ENCODER
Metric code
Morse code
Computer language
TRANSMITTER
Carbon granula transmitter
Offset press
Paper
Mail carrier
CHANNEL
Wire
Paper
Film
Ether
SEMANTIC DECODER
Radio receiver
Electromagnetic receiver
Television CRT
RECEIVER
Machine
Human
Animal
DESTINATION
Land
Air
Marine
Space
NOISE
Psychological
Semantic
Electrical
Audio
Visual
FEEDBACK
Audio
Symbol
Electrical
Video
Electromagnetic

Major Printing Processes Compared

CHARACTERISTICS	Offset	Letterpress	Screenprint	Gravure
PLATE SKETCH SIDE VIEW	Flat Surface 	Raised Surface 	Through-The-Surface 	Sunken Surface 
SIMPLIFIED SKETCH OF PRESS	 substrate	 substrate	 substrate	 substrate
FACTS ABOUT THE PLATE	• plane surface • offset principle • photographically prepared plate • ink/water repel each other • indirect printing • 1798, Senefelder	• relief surface • extreme pressure necessary • plate prepared by hand or machine • direct printing • oldest process, 1450, Gutenberg	• printing through the surface • little pressure • plate largely prepared photographically • direct printing • old stencil process	• sunken surface • moderate pressure • chemically etched plate • extremely durable plate • expensive plate • direct printing
HOW THE RESULTING PRINT LOOKS	SIDE VIEW  TOP VIEW Uniform Density Straight Edge	 Squeeze Out	  Dense Ink Buildup, Stair-step Edge	  Looping Edge

PROCEDURE FOR DEVELOPING 35 mm ROLL FILMS

1. Make sure you have all equipment and chemicals in the dark room in an easily accessible position.

   Equipment Needed

   a) developing tank
   b) tank lid
   c) reel
   d) agitation rod
   e) scissors
   f) 8 oz graduate
   g) tank thermometer
   h) cassette opener
   i) film squeegee/sponge
   j) towel

   Chemicals Needed

   a) D-76 developer
   b) 68°F water
   c) fixer
   d) Photo-flo

   Inspect all tank parts. Make sure each part is clean and free from defects. Film reel must be absolutely dry!

2. Cut off film leader and round corners so that no snags appear.

3. Lock door (of a completely darkened room) and make sure it's locked. Place scissors and tank and tank parts in a convenient position on dry bench in front of you.

4. Turn out all lights.

5. Remove cap from cassette (use cassette opener). Push spool out of cassette case.

6. Load film onto developing reel. After film is loaded, cut off spool with scissors.

7. Place reel of film into tank (reel spindle up), put lid on tank and turn clockwise one-fourth turn to make light-tight.

8. Steps 5, 6 and 7 should be accomplished on the dry bench.

9. Turn on white lights.

10. Move tank to sink and wash with 68°F water to pre-wet film. Pre-wetting helps to prevent bubbles and developer streaks.

11. Mix D-76 developer:
    8 oz D-76 stock solution
    8 oz water
    16 oz total working solution at 68° F

12. Set timer. (Check film data sheet for correct time).

13. Pour water out of tank and pour in working solution of D-76. Start timer when all of solution is in tank.

14. Watch timer. Agitate for five seconds every 30 seconds.

15. Pour solution out of tank starting 20 seconds prior to completion of prescribed time.

16. Fill tank immediately with water. (Stop bath). Drain tank and fill with water two more times. Be sure tank is drained of water.

17. Fill tank with fixer. Agitate every 30 seconds. Consult film instruction sheet for fixing time.

18. Pour fixer back into fixer bottle after fixing of film. Make sure you are pouring into the fixer bottle. (Fixer will contaminate developer.)

19. Remove tank lid and remove reel from tank. Place film reel with film into washer, or allow fresh water to run into tank. Set water temperature at 68° F and wash for 5 minutes.

20. Wash developing tank for one minute.

21. Prepare Photo-flo solution. (1/2 capful of concentrated Photo-flo to a tankfull of 68° F water)

22. Immerse film and reel in to Photo-flo solution for one minute.

23. Wash film squeegee/sponge in Photo-flo solution, drip out excess and pull film through sponges or squeeze with firm even pressure.

24. Hang film to dry in drying cabinet. Use loose clip on bottom end of film to make film hang straight.

25. Allow at least an hour for film to dry. Do not handle until completely dry. Lint from clothes and dirt or oil from hands will permanently damage damp film.

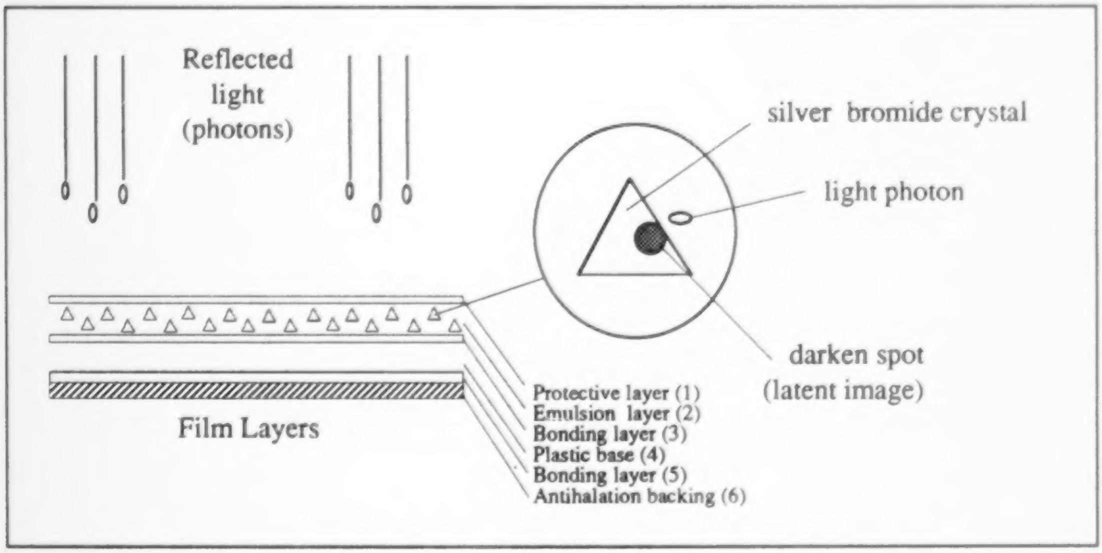
26. Return to film processing room and clean up!
    a) pour working Phot-flo solution down drain.
    b) wash thoroughly with hot water all tank parts (reel, lid, tank, agitation rod, graduate, funnel, thermometer, etc.)
    c) after equipment is washed, place lid and tank upside down to drain. Separate reel and place each part on shelf above sink.
    d) Turn off water and lights.

The Structure of Photographic Film

by Jerry J. Richter

Photographic film is not a solid or monolithic piece of material. In fact, it is constructed more like a sandwich; it consists of many layers (See Illustration - 1). Film that is used for making black and white photographic prints has six (6) layers.

Illustration - 1


Reflected light (photons)
silver bromide crystal
light photon
darken spot (latent image)
Film Layers
Protective layer (1)
Emulsion layer (2)
Bonding layer (3)
Plastic base (4)
Bonding layer (5)
Antihalation backing (6)

The Base Layer The base layer is the vehicle to which all of the other layers are atttached. As shown in Illustration - 1, the base layer is thicker than all the other layers combined. Made of a flexible and nearly transparent plastic called cellulose acetate, the base layer is constructed to be rugged and durable if used in a reasonable fashion.

The job of the base layer is three fold. It must be transparent to allow light to shine through it's clear areas after it is processed into a negative. It must be flexible. This allows it to be rolled. Unlike older cameras where only one piece of film could be placed in the camera, roll film has made it possible to shoot up to 36 frames in many cameras. This convenience, introduced by George Eastman around 1901 has made photography very popular. It must be safe. Cellulose acetate, when burned, emits no dangerous fumes. Older style films were created with base layers that burned and produced deadly fumes for the unsuspecting victim. Today's films are, consequently, labeled as "safety film".

Bonding Layers At the time of its manufacture the base layer is coated on both sides with a thin adhesive layer. These bonding layers are also transparent, and function as an adhesive to hold two other layers to the base.

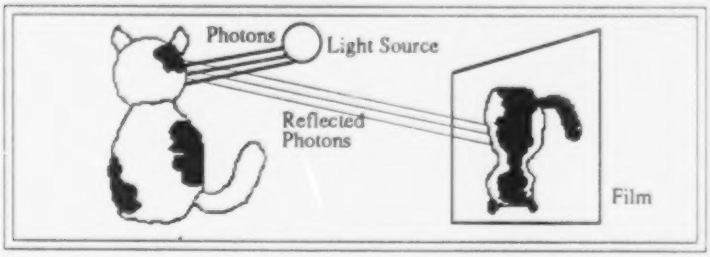
Emulsion Layer The emulsion layer is attached on top of the base layer (See Illustration - 1). It is the most important one because it records the image. It is in the emulsion layer that beautiful detail and tones are recorded to communicate an effective photographic statement. The make up, exposure and development of the emulsion layer is central to good photography.

The emulsion layer is made of two major components - gelatin and silver bromide cystals. The gelatin is a soft, clear jello-like substance that is attached to the base layer with the bonding layer. Within the gelatin are suspended millions of microscopically small silver bromide crystals all more or less equidistant from one another. In a selected film the crystals are all of equal size and uniformly distributed througout the gelatinous emulsion layer. Films with large silver bromide crystals are called fast films (ASA 400) and record light so quickly that they record pictures well even in dim light. Films with small silver bromide crystals are called slow films (ASA 32) because they record light so slowly that they often require a bright sunny day to record an image satisfactorally. In either case the silver bromide crystal is the substance that records the image.

Under a microscope silver bromide crystals appear as tiny particles of white salt. If they are kept in darkness or in the complete absence of light they remain white. However, when even a small amount of light is allowed to strike them they begin to change. Particles of light cause this transformation.

Light is sometimes thought of as hundreds of trillions of radiant particles called photons. Photons originate from artificial light sources and from the sun. Theoretically, they travel at 293, 548 km per second! When these photons hit a single silver bromide crystal it begins to darken. When taking pictures outdoors photons coming from the sun strike and then reflect off of the subject you are photographing. Many of the photons bounce off your subject, but some do not . In fact the lightest portions of subjects reflect the most photons, the darkest areas the least. It is the relative difference in reflection of photons from the light and dark areas of the subject that makes the emulsion layer record tones and patterns identical to the subject. Consequently, the more light reflected from the subject to the film the more silver bromide crystals are darkened in that area on the film (See Illustration - 2). The less light reflected from some portion of the subject the fewer silver bromide crystals are exposed to light from that area. Therefore, when developed, the film displays a negative image with a range of tones from total blackness, through patterns of gray, to areas of the film not struck by light at all. The emulsion layer creates a permanent image of black silver particles arranged in patterns that accurately depict the original subject.

Illustration - 2



The negative is a reversal of the subject; white areas become black on the negative.

Protective Layer Because the emulsion layer is soft gelatin chances are good that it could be scratched or otherwise damaged. Even handling film incorrectly, that is, holding the film by its surfaces rather than by its edges, can damage the emulsion layer with finger prints. To help avoid these problems film manufacturers place a thin protective layer over the emulsion. Can you explain why the protective layer must be transparent?

Antihalation Backing Layer The bottom layer of the film in Illustration - 1 is called the ANTI-HA-LA-TION backing. It is usually black or red in color; if you are willing to pull a small amount of film out of its cannister you will be able to see a black (or at least darker) side, and a whitish side (the silver bromide crystals in the emulsion). The antihalation backing is always the darker side of the film.

The job of the antihalation backing is to absorb photons of light. You will recall that silver bromide crystals are evenly distributed in the emulsion layer. By comparison, the photons that strike them are extremely small. Many photons pass between the crystals and strike the black antihalation backing. This black backing absorbs the photons and holds them. By holding them the photons are not allowed to bounce, scatter in every direction and strike the silver bromide crystals from behind, causing blurred images on the negative. Can you explain why the negative's image would be blurred if the antihalaiton backing were white in color?

Photographic film is a sandwich with six (6) layers. The top or protective layer is number one (1). The second (2) layer is the emulsion layer. Layer three (3) is a bonding layer. Next is layer four (4), the base layer. Under the base is layer five (5), another bonding layer. It holds layer six (6) in place, the antihalation backing. With this theoretical description of film in mind you are now ready to develop it.

Developing Film

Developing film is a processing technique in which each layer of the film is altered. With minor changes the procedure can be used with most Kodak black and white films. During the development procedure, the developer makes the image visable by reducing the exposed silver bromide crystals to black metallic silver. It also removes the black antihalatin backing. The fixer also removes the milky white silver bromide crystals; these are the ones that were not hit by the light reflected from the subject. Since the base plastic layer is transparent, the resulting negative is clear where the fixer removed unexposed crystals, and black where those crystals exposed to light were turned to black by the developer. Study the developing procedure before you attempt to develop your film. What do you suppose is the job of the stop bath? What is the job of the Photo-flo?

GENERAL CRITERIA FOR AN ACCEPTABLE PRINT

by Jerry Richter

Technical Qualities

yes no

☐ ☐ 1. Was the print made from a negative free of scratches and lint?

☐ ☐ 2. Was the print made from a normally exposed negative, that is one which was neither grossly over or under exposed?

☐ ☐ 3. Is the center of interest in the picture in sharp focus?

☐ ☐ 4. Does the print show detail in both the highlight (white) and shadow (black) areas?*

☐ ☐ 5. Is the print free of excessive grain, especially in the grey tone areas?

☐ ☐ 6. Does the print have sharp, clearly defined borders?

☐ ☐ 7. Does the print fit the format? (Are tall images printed vertically?)

☐ ☐ 8. Is the emulsion on the print paper free of bruises?

☐ ☐ 9. Is the print black and white (i.e. not brown, purple or black?)

If you have answered no to any one of the above the print is unacceptable.

*and exception to this is a silhouette.

Compositional Qualities

Category #1

☐ ☐ 1. Does the print have a strong, clearly obvious center of interest?

Category #2

☐ ☐ 1. Does your print have partial or complete framing?

☐ ☐ 2. Does your print use the rule of thirds?

☐ ☐ 3. Does your print employ leading lines?

☐ ☐ 4. Is your print free of mergers?

Category #3

☐ ☐ 1. Does your print demonstrate texture?

☐ ☐ 2. Does your print show emphasis through selective focusing, tonal or size relationships?

☐ ☐ 3. Does your print have harmonious and unified images?

☐ ☐ 4. Does your print have complimentary foreground and /or background?

☐ ☐ 5. Is the image area on your print balanced formally or informally?

☐ ☐ 6. Does your print utilize a pleasing perspective angle?

☐ ☐ 7. Does your print demonstrate mood?

☐ ☐ 8. Does your print have impact?

☐ ☐ 9. Is your print uncluttered and simple?

If your print does not display at least one guideline in each of categories 1, 2 and 3, it is unacceptable.

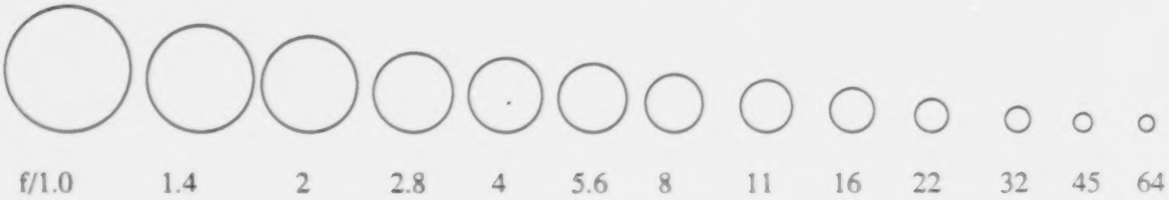
EXPOSURE CONTROLS

by Mel Jenkins

EXPOSURE consists of the systematic control of the amount of light passing through the lens to the film and the amount of time. Exposure is subject to two mechanical controls on the camera, the diaphragm and the shutter.

THE DIAPHRAGM, also known as the aperture or the f-stops, is a series of metal blades, adjustable to various size openings in a lens, more commonly referred to as the f-value. The diaphragm is calibrated accordingly to a series of f-values known as the Major f-Stop Sequence.

THE MAJOR f-STOP SEQUENCE (Memorize)



Moving the f-stop selector from one number to the next in sequence will reduce or increase the intensity of light passing through the lens by two each time. Example: f/4 will let through two times more light thanf/5.6. Another Example: f/16 will let through two times less light than f/11. Another Example: f/22 will let through four times less light than f/11.

Most lenses do not have the entire major f/stop sequence. Many 35mm cameras will have the sequence from f/1.4 through to f/16. Many 120 size cameras will have from f/2.8 through to f/22. Larger cameras that use large sizes of sheet film will have from f/4 through to f/64.

INTERMEDIATE f/STOP SEQUENCE are f/values that are half-way between each of the major f/stops. Most lenses do not have the markings to designate the intermediate f-stops.

f/1.0 | 1.4 | 2 | 2.8 | 4 | 5.6 | 8 | 11 | 16 | 22 | 32 | 45 | 64

1.2 1.7 2.5 3.5 4.5 6.3 9 14 19 27 38 55

Moving the f-stop selector from one intermediate stop to the next intermediate stop in sequence will reduce or increase the intensity of light passing through the lens by two each time. When the intermediate stops are not marked, a persons own personal judgement is used as to where half-way is located.

DEPTH OF FIELD is the distance between points nearest and farthest from camera wherein all items are exceedingly sharp in focus.

The size of the f/stop has a great deal to do with the depth of field -- the smaller the diaphragm opening (larger number) the greater the depth of field -- the larger the diaphragm opening (smaller number) the shallower or the less depth of field.

THE SHUTTER is a mechanical device in the camera which keeps light from falling upon the film emulsion except during the time interval of purposeful exposure. A camera may have one of two types of shutters, a leaf type of shutter, located between the lens elements, or a focal plane shutter, located just in front of the film plane. Regardless of the type of shutter your camera has, the shutter is the device that regulates the time duration of the exposure.

INTERNATIONAL SHUTTER SPEED SEQUENCE (Memorize)

T B 1 2 4 8 15 30 60 125 250 500 1000

The number "1" designates one full second of time. All other numbers designate a fraction of one second of time. "T" and "B" are for exposures longer than 1 full second.

"1" is 1 second
"2" is 1/2 second
"4" is 1/4 second
"8" is 1/8 second

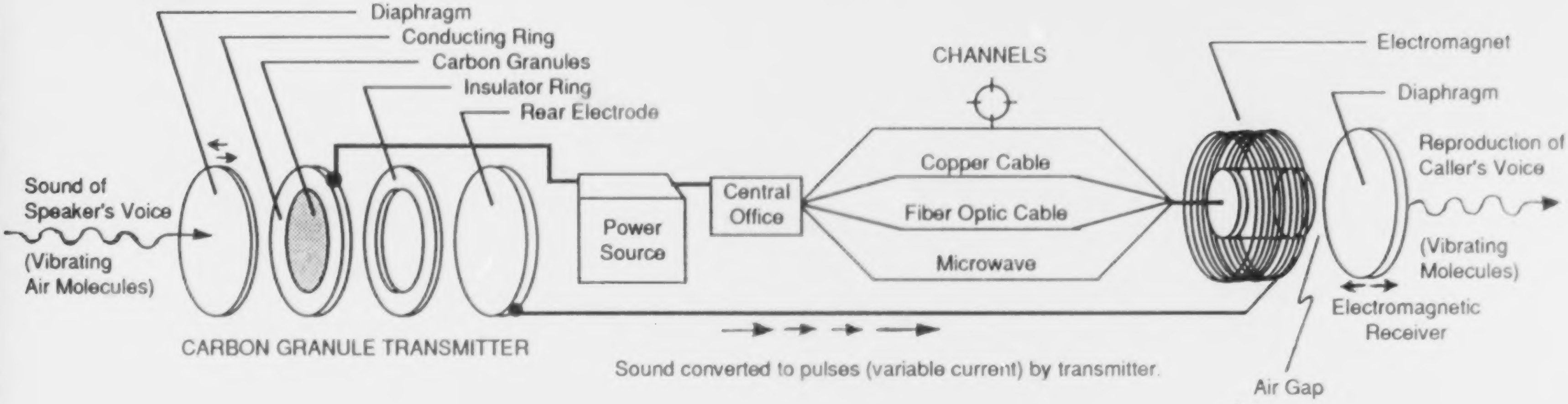
"15" is 1/15 second
"30" is 1/30 second
"60" is 1/60 second

"125" is 1/125 second
"250" is 1/250 second
"500" is 1/500 second
"1000" is 1/1000 second

Moving the shutter speed selector from one shutter speed number to the next number in sequence will reduce or increase the intensity of light getting to the film by two each time.

EXAMPLE: 1/8 will let in two times more light than 1/15; 1/8 will let in four times more light than 1/30; 1/8 will let in eight times more light than 1/60; 1/8 will let in sixteen times more light than 1/125.

Many cameras have all the shutter speeds that are in the International Shutter Speed Sequence while others may have only a few speeds. Some cameras may have a shutter speed sequence which is entirely different than that of the International Sequence; in such a case, a person would have to know or learn what each number represents to the other numbers.


Diaphragm
Conducting Ring
Carbon Granules
Insulator Ring
Rear Electrode
Sound of Speaker's Voice
(Vibrating Air Molecules)
CARBON GRANULE TRANSMITTER
Power Source
Central Office
CHANNELS
Copper Cable
Fiber Optic Cable
Microwave
Sound converted to pulses (variable current) by transmitter.
Electromagnet
Diaphragm
Reproduction of Caller's Voice
(Vibrating Molecules)
Electromagnetic Receiver
Air Gap

Elements of a Simple Telephone Circuit

CARBON GRANULE TRANSMITTER - HOW IT WORKS

The production of speech sounds by human beings cause air molecules to vibrate at an intensity proportional to the sounds. As these moving air molecules bump back and forth, they cause the diaphragm in the telephone transmitter to viberate, that is, flex in and out. When the moving molecules push the diaphragm in, it compresses the loosely packed carbon granules against the rear electrode and conducting ring simultaneouosly. Those granules pushed against one another, act as switches or gateways through which electric current flows. The more of them that are packed together, the more they allow electric current to flow through them from the conducting ring to the rear electrode. The pulses of current then flow to the receiver.

ELECTROMAGNETIC RECEIVER - HOW IT WORKS

Since human speech consists of a variety of sound intensities, the granules compress proportionately - sometimes more, sometimes less. The more they are compressed, the more do they allow electric current to flow to the receiving phone. This variable current passes through the electromagnet attached just behind another diaphragm. (The gap between diaphragm and electromagnet is a necessary space in which the diaphragm wabbles). The electromagnet becomes active; its on-off magnetism pulls on the diaphragm causing it to flex back and forth. The air molecules on the opposite side of the diaphragm are bumped and set into motion. They in turn bump against the human ear drum and are heard as sound, a reconstruction of the caller's voice.

SAMPLE INTERVIEW QUESTIONS

1. Tell me a little bit about yourself.
2. Why do you want to work in this field (job)?
3. How would you improve the design of a giraffe?
4. Which of your accomplishments give you the most satisfaction and why?
5. What are your greatest strengths?
6. What are your weaknesses?
7. What contributions could you make to the job you seek?
8. Why should I hire you?
9. Give me an example of a major problem you've solved.
10. What is more important to you, salary or the job itself?
11. Are you willing to relocate?
12. What would you like to be doing in five years?
13. How much do you expect to be earning in five years?
14. What do you do in your free time?
15. Can you supervise people? How do you know?
16. Are you prepared to travel?
17. What are your long-term goals?
18. How quickly do you feel you will be able to contribute to this department?
19. How are your grades in high school?
20. What people in life do you most admire?
21. Describe your relationship with your last supervisor.
22. Why didn't you return to the company that you worked for during the summer?
23. This job requires some skill in computers. How do you feel about working with computers or other technical equipment?
24. Why did you want to interview at this company?
25. What is your minimum salary requirement?

TIPS ON INTERVIEWING

* Research the company
* Appearance is crucial
* Timeliness
* Resumes and writing samples
* Make allies of everybody
* Consider the interviewer's problem
* Concentrate on first impressions
* Eliminate nervous mannerisms
* Names are important
* Smoking may be dangerous to your career
* Show self-confidence
* Show sense of worth
* Let interviewer control first interview
* Never bad-mouth anyone
* Contain emotions
* Speak out when necessary
* Anticipate objections
* Enthusiasm is all-important
* Follow up
* Even failures provide information
* Practice . . . Practice . . . Practice

RESUME CHECKLIST

- * Do not exceed one page
- * Minimize personal information
- * Select a format which best suits your qualifications
- * Use quality 8 1/2" x 11" white bond paper for resume and cover letter
- * Make graphically pleasing (Center on page, use white space in design)
- * Highlight skills and capabilities
- * Proofread to eliminate all errors
- * Use action verbs to describe duties
- * Use underlining and bullets to emphasize skills
- * Use good typewriter or letter quality printer
- * Use fresh dark ribbon on printing equipment
- * Include marketable, relevant data only
- * Avoid using first person "I"
- * Be honest and accurate
- * Supply examples to support personality traits
- * Review final draft with counselor or friend
- * Stress accomplishments
- * Always include cover letter
- * Try to tailor cover letter and resume to specific qualifications of job you're applying for
- * Leave off references unless exceptional
- * Know your audience
- * Proofread again

Example: Below is an illustration of how activity (9) in Unit-7, Information Storage and Retrieval, could be charted.

Retrieving Concept

	ACCESSING	ABSTRACTING	INDEXING	CONTROLLING
SCHOOL LIBRARY AND CATALOG	Use catalog by physically pulling and searching selected drawer.	References are listed alphabetically by author, subject or title.	Catalog cards present a brief description of document.	Rules, regulations and operating hours are monitored by the library board.
PERSONAL COMPUTERS	Use by booting computer and selecting desired software program and file.	Documents are found alphabetically in named files; files are stored on named data disks.	Files and documents contain descriptive names.	Key and/or logon (password) identification numbers are necessary.
ENCLOPEDIA BRITANNICA	Use by consulting the Propedia outline of knowledge.	Articles are retrieved alphabetically in numbered volumes of Macropedia, knowledge in depth.	Summary of articles are found in the micropedia.	Housed as reference books, that cannot be checked out.
AUTOMATIC BANK TELLER	Place credit card with magnetic coded I.D. number in slot.	Selection options appear in a menu.	Prompt messages describe actions possible, provides ending balance.	Machine controlled by I.D. number or password; machine retains card if invalid; credit limits control "excessive" use of machine.

TELECOMMUNICATIONS AND TELECOMPUTING

by Don Costello

What do you think of when someone mentions the word computer? How about the words "computer usage"? Perhaps your first thought dealt with the speed or accuracy of the hardware. Your second thought may have been with different types of software such as games, word processors, paint programs and others. But have you thought of it as a communications link? Specifically, a device to electronically send and receive messages from one computer to another. The term used for this electronic exchange of information is telecomputing. Through telecommunications, communication with the use of the cables, wires or telephone lines, we can link computers to exchange a variety of data.

What kind of information or data can be exchanged by telecomputing? Here is a short list:

Games
Movie reviews
News reports
Weather reports
Airline reservations
Medical records
Football scores
Bank transactions
Computer programs
Stock prices

The list is long and people are coming up with new ideas daily.

It should be noted that the telephone line is not the only line that connects computers together. They are also connected by means of cables and wires for short distances, such as in a LAN network - local area network. This network can be found where computers are connected together in a building or in the same room. This networking arrangement is popular among businesses and schools.

Everyone is realizing the benefits that telecomputing has to offer. Librarians use telecomputing to access large data bases for listing of books or magazines. Counselors are connecting colleges for enrollment requirements and class offerings. Police send and receive information on suspected criminals and lost or stolen children. Uses of telecomputing are endless and are not just limited to the areas mentioned. Schools, hospitals and businesses can and do use the

Why is telecomputing being used by all these people? Well, there are several advantages with telecomputing. First, it is fast, accurate and direct. Information is sent in literally a matter of seconds and directly to the person you are typing to through their electronic mail box. Its accuracy hinges solely on your keyboarding skills and knowledge of the software.

Secondly, information can be processed rapidly. As you might know, computers can sort through large amounts of information and display specific data in a matter of minutes or even seconds. An example would be a lawyer that has to access legal information from a data base. In less than an hour he could research and receive the information needed that would have taken him hours or even days to find by searching through law books and legal opinions.

Thirdly, information can be easily accessed. Imagine a sales person working in St. Louis and preparing to give a presentation. He realizes that an important financial statement is missing and this statement is the key component of his presentation. With telecomputing, he can receive the statement well before his sales presentation begins.

What is needed to do telecomputing? The most obvious part of telecomputing is the computer. It does not matter what kind of computer you have, thanks to ASCII (American Standard Code of International Information). ASCII allows computers to send a common language and translate it to make it compatible with the receiving computer. It is sometimes known as the handshake between the two computers. The information may not be in the form that it was sent, but all the information will be received.

A modem (short for MOdulator - DEModulator) takes your input and modulates it or translates it to audio tones. This tone is then capable of traveling through the telephone line to a receiving computer. This receiving computer, which must also have a modem, then must demodulate or translate back the audio tones to computer signals. There are basically two types of modems. The first, is an internal modem. It is plugged into a port located inside the computer. The advantage of this type of modem is that it diminishes the possibility of someone tampering with it. The internal modem also saves desk top space. The second type is an external modem.

It is located outside the computer similar to a disc drive. The main advantage of this type of modem is its capability of connecting to other computers. With the ease of a switching device, the modem can be switched to a computer that is in need of a data base or electronic bulletin board.

Modems come in different speeds or baud rates. This is the speed at which it sends and receives information. The baud rates start at 300 and double to 9600 (300, 600, 1200, 2400, etc.). The advantage of the faster speed is obvious; the faster one can download information the less time is spent on a data base or long distance phone line. It should be noted that even if you have a modem with a 9600 baud rate it will only send and receive at a rate which the other computer can communicate. Most modems will run a baud rate of 300 to 2400; the faster the baud rate usuallythe higher the price of the modem. Most bulletin boards run at 1200 or 2400. If your modem is a 300 or 600, it should still be compatible.

A telephone line will be required to complete the physical connection of the sending and receiving computers. You would prefer a line that is dedicated for your computer's use only. If this is not possible, you will need some method of locking out other phones on that line or leave a note on the phone instructing people not to lift the receiver. If someone does pick up the receiver, they will hear a loud screech and your computer will have "garbage" run across the screen. This may cause problems during logging on or accessing different menus or boards.

The last piece of hardware that you may consider is a printer. The reason for this device is obvious. It will give you a hard copy of the information or data that you have received. This will allow you to copy and then read and evaluate the data at your own convenience.

Besides all the mentioned hardware, you will need some telecomputing or telecommunications software. Software is 5 1/4 or 3 1/2 inch disk or disks that boot up the computer, initialize the modem and store data. In addition, some telecommunications software allows you to store telephone numbers, redial busy numbers, create macros (macros allow you to call a BBS or data base and place you at the main menu bypassing the welcome and password sections) plus other options.

Now that you know what is needed in hardware and software, let's look at some of the services that can be used with telecomputing. One service is a data base service and the other is an Electronic Bulletin Board.

There are several data banks or information services that can be accessed. Some are intended for specific users while others are open to people with all interests.

Data banks are like electronic information storage warehouses. The difference with this warehouse is instead of rooms full of books, magazines and newspapers, this is one room with a computer that has megabytes of information on disk drives ready for retrieval. All this information can be accessed in a matter of seconds or minutes and then down loaded to your disk drive for later retrieval.

These services can save you time, but they do have a cost. The cost will range from $10 to $300 an hour depending upon the type of data that is needed. Fortunately, because of the speed of the computer and modem accessing information can take only minutes. There are many data banks, but here is a list of a few with a brief description of each:

The Source

Dow Jones

Applelink

NEXIS

Dialing Information Systems

If you are looking for more interaction with telecomputing, then an Electronic Bulletin Board System or EBBS is your answer. These systems are designed to exchange ideas, information and messages. EBBS's are overseen by a System Operator or Sysop. They are responsible for setting up the system, starting new special boards, validating new log-ons, monitoring the ethical behavior of users and deleting people that do not follow the rules.

There may be costs involved with some EBBS's. Some charge a one-time user fee while others charge a by-the-hour rate. You should also know that even if a free EBBS is used but it is outside your area code, it will be a long distance call and will be placed on your phone bill.

After hours then, may be the best time to access EBBSs for lower costs and the added bonus.

Use of an EBBS is usually simple. Program the software to dial a system. Then, dial a system and the host computer will answer the phone with a welcome message. You will probably be asked to identify yourself or be asked if you are a new user. If you are a new user, you will be asked: name, address, city, state, type of computer and certain information about your computer. A password will be needed to verify yourself. Validation or acceptance will take around 24 hours, then your access time will be extended. The first time on will only be 5 to 10 minutes.

A word about your password. This is the key to accessing the EBBS after the first log-on. Without this password, you will not be allowed on the system. So don't forget it or give it out to anyone. If other people are privileged to your password, they may receive your messages or behave in an unethical manner and you may be invalidated.

Once inside the board there will be a main menu. Here you will choose from: information about the board, new sub-boards, and your electronic mail. Electronic mail is personal letters, replies or messages that are received from participating in sub-boards. Electronic mail is very personable. Only the person sending the mail, yourself and the Sysop may read it (unless you have given out your password). Sub-boards have been mentioned twice. Let's discuss them further.

Sub-boards are specialized boards setup inside the general EBBS. These boards are requested by users and then setup by the Sysop. One person (usually the person that requests the sub-board) is designated as chairperson of that board and controls its running. Some examples of sub-boards are:

Buy / Sell / Donate
IBM users
Tech News
Science
Shareware
Hobbies
Apple Users
Tech Activities
Physics
Story Board

All this information can be uploaded or sent for public use then downloaded to a storage disk. It should be noted that proper etiquette must be observed for information that is copywrited and cannot be uploaded or downloaded.

There are other computer services that you may be aware of such as Electronic Banking, Home Shopping, Entertainment and others. With telecomputing, people are able to work from their home. Those students that live long distances from a school can go to class. Others can share their ideas with those that live in a different city, state or country. Telecomputing is limitless and changing. The new entry into telecomputing is Facimile or Fax for short. This is a different type of telecomputing and has its own advantages and disadvantages, and is another presentation. In the beginning, you were asked about your thoughts on computers. The question presented now is, what are some uses of telecomputing?

Concept Outline of Communication Technology

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Objective:
Select several of the technical activities accomplished in the unit and compare them to the concept outline of communication technology below.. Find the concepts that describe the activity.

Directions: Match the activity to the concept that describes it.

Activity	Concept	Explanation

1. **Encoding**
   - 1.1. Designing
     - 1.1.1. Formulating
     - 1.1.2. Researching
     - 1.1.3. Composing
     - 1.1.4. Evaluating
   - 1.2. Converting Acoustical to Electrical Energy
     - 1.2.1. Transducing
     - 1.2.2. Controlling Directionality
   - 1.3. Converting Light to Electrical Energy
     - 1.3.1. Illuminating
     - 1.3.2. Focusing
     - 1.3.3. Electrical Emitting
     - 1.3.4. Photosensing
     - 1.3.5. Scanning
     - 1.3.6. Synchronizing
   - 1.4. Converting Light to Latent Chemical Image
     - 1.4.1. Illuminating
     - 1.4.2. Focusing
     - 1.4.3. Exposing
     - 1.4.4. Scaling
     - 1.4.5. Selecting Emulsion
   - 1.5. Converting Mechanical to Electrical Energy
     - 1.5.1. Vibrating
     - 1.5.2. Positioning
     - 1.5.3. Depressing
     - 1.5.4. Rotating
   - 1.6. Converting Heat to Electrical Energy
     - 1.6.1. Thermocouple Sensing
     - 1.6.2. Thermistor Sensing
     - 1.6.3. Resistive Temperature Sensing

2. **Transmitting**

- 2.1. Modulating
    - 2.1.1. Pulse Coding
    - 2.1.2. Pulse Duration Varying
    - 2.1.3. Frequency Varying
    - 2.1.4. Amplitude Varying
    - 2.1.5. Phase Varying
    - 2.1.6. Encrypting
- 2.2. Amplifying
    - 2.2.1. Frequency Filtering
    - 2.2.2. Carrier Signal Generating
    - 2.2.3. Signal Adding
- 2.3. Multiplexing
    - 2.3.1. Time Division
    - 2.3.2. Frequency Division
- 2.4. Duplexing
    - 2.4.1. Simplexing
    - 2.4.2. Half Duplexing
    - 2.4.3. Full Duplexing
    - 2.4.4. Quadraplexing
- 2.5. Frequency Selection
    - 2.5.1. Electrical
    - 2.5.2. Optical
- 2.6. Propagating
    - 2.6.1. Atmospheric Channeling
    - 2.6.2. Physical Channeling
- 2.7. Signal Conditioning
    - 2.7.1. Electrical-to-Light Converting
    - 2.7.2. Light-to Electrical Converting
    - 2.7.3. Analog-to-Digital Converting
    - 2.7.4. Digital-to-Analog Converting
    - 2.7.5. Serial-to-Parallel Converting
    - 2.7.6. Parallel-to-Serial Converting
    - 2.7.7. Establishing Protocol
- 2.8. Switching
    - 2.8.1. Sensing Access Request
    - 2.8.2. Determining Destination
    - 2.8.3. Selecting Path
    - 2.8.4. Establishing Connection
    - 2.8.5. Disconnecting Circuit

3. **Receiving**
    - 3.1. Collecting
        - 3.1.1. Detecting
        - 3.1.2. Positioning
        - 3.1.3. Selecting
    - 3.2. Connecting
        - 3.2.1. Splicing
        - 3.2.2. Soldering
        - 3.2.3. Coupling
        - 3.2.4. Bonding
    - 3.3. Amplifying
        - 3.3.1. Frequency Filtering
        - 3.3.2. Signal Regenerating
        - 3.3.3. Signal Adding

- 3.4. Demodulating
  - 3.4.1. Pulse Coding
  - 3.4.2. Pulse Duration Varying
  - 3.4.3. Frequency Varying
  - 3.4.4. Amplitude Varying
  - 3.4.5. Phase Varying
  - 3.4.6. Decrypting
- 3.5. Demultiplexing
  - 3.5.1. Time Dividing
  - 3.5.2. Frequency Dividing

4. **Storing**
- 4.1. Separating
  - 4.1.1. Latent image processing
  - 4.1.2. Punching
  - 4.1.3. Machining

Example: Hollerith Cards

Punched cards are read by computer reader.

- 4.2. Coating
  - 4.2.1. Fixed Raised Surface Printing
  - 4.2.2. Addressable Raised Surface Printing
  - 4.2.3. Plane Surface Printing
  - 4.2.4. Sunken Surface Printing
  - 4.2.5. Through-the-Surface Printing
  - 4.2.6. Spraying-the-Surface Printing

Example: Screen Printing

Deposits ink on a substrate in the form of symbols that Convey information.

- 4.3. Conditioning
  - 4.3.1. Magnetizing
  - 4.3.2. Positioning Substrate
  - 4.3.3. Demagnetizing
  - 4.3.4. Creating a Fringe Field
  - 4.3.5. Head Positioning
  - 4.3.6. Heating
  - 4.3.7. Positioning Substrate
  - 4.3.8. Controlling Heat Source
  - 4.3.9. Developing

Example: Mylar Disk

Floppy Disk receives magnetic spots that constitute bits of information.

Example: Photographic Film

Silver Bromide Crystals are reduced to black metallic silver.

- 4.4. Forming
  - 4.4.1. Positioning Substrate
  - 4.4.2. Applying Heat and/or Pressure

5. **Retrieving**
- 5.1. Abstracting
  - 5.1.1. Assessing Item Count
  - 5.1.2. Summarizing Item Count
- 5.2. Indexing
  - 5.2.1. Determining Search Vocabulary

- 5.3. Accessing
  - 5.3.1. Locating
  - 5.3.2. Recalling
- 5.4. Controlling
  - 5.4.1. Identifying User
  - 5.4.2. Determining User Retrieval Privileges

6. **Decoding**

- 6.1. Converting Electrical to Acoustical Energy
  - 6.1.1. Acoustic Baffling
  - 6.1.2. Transducing
  - 6.1.3. Acoustic Wave Generating
- 6.2. Converting Electrical to Light Energy
  - 6.2.1. Picture Element Locating
  - 6.2.2. Light Emitting
  - 6.2.3. Light Reflecting
- 6.3. Converting Electrical to Mechanical Energy
  - 6.3.1. Striking
  - 6.3.2. Controlling
  - 6.3.3. Positioning
  - 6.3.4. Vibrating
- 6.4. Projecting
  - 6.4.1. Illuminating
  - 6.4.2. Scaling
  - 6.4.3. Focusing
- 6.5. Reflecting
  - 6.5.1. Illuminating